Computer support of collaborative case based learning by MBA students

Thesis

COMPUTER SUPPORT OF COLLABORATIVE CASE BASED LEARNING BY MBA STUDENTS

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Thesis submitted for the degree of Doctor of Philosophy
in Educational Technology

February 1998

ABSTRACT

Many UK MBA programmes adopt a collaborative approach to the Harvard style of experiential case based learning. Within such programmes there is widespread use of computers but it is not clear how this improves student learning. Research on computer support of collaborative learning in other disciplines is of limited applicability because of the dual role of student as learner and as expert. In management education such research has mainly focused on technology.

Within this context this exploratory research seeks to establish how the actual use of computers in the collaborative study of cases within MBA programmes affects the efficiency and effectiveness of the learning process.

Three core courses from well-respected MBA programmes are studied in detail. Student attitudes are investigated using an established instrument and an open-ended questionnaire. In each course student behaviour is observed by studying one aspect of the course in which computers are being used. Data is collected through videos, participant observation and the capture of online conferences.

The three MBA programmes have comparable core curricula and computer rich environments. Delivery modes are full-time, part-time and distance so they cover a wide spectrum of the MBA student population in the UK.

Six propositions arise from the investigations of which four are established by this research. These show that UK MBA students are enthusiastic about computers and believe in their ability to use them competently. Most students do use computers extensively at all stages of collaborative case based learning. However there is a marked dissonance between their attitude and actual use. If this dissonance is addressed students can improve both the efficiency and effectiveness of their learning through using computers.

ACKNOWLEDGEMENTS

My thanks to my supervisors Tony Kaye and Andrew Thomson and to my wife, partner and fellow PhD student Clare Tagg for advice, guidance and support.

My thanks also to the students, faculties and administrative staffs at Cranfield School of Management and the Open University Business School for answering my questions and allowing me to observe them.

Parts of chapter two were first published in Innovations in Education and Training International, Volume 33 no.1 pp70-73 and are reproduced by AETT's and SEDA's permission. Innovations in Education and Training International is published by Kogan Page on behalf of the Association for Educational and Training Technology, BMA House Tavistock Square, London WC1H 9JP, England, and the Staff and Educational Developers Association, Gala House 3,Raglan Rd., Edgbaston, Birmingham B5 7RA.

Parts of chapter four will be published in "Innovation in Business Education: theory and practice" and are reproduced by permission. "Innovation in Business Education: theory and practice" will be published by Kluwer Academic Publishers (Dordrecht, Boston, London).

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1 Introduction

MBA students are different.

In looking at computers and collaborative learning in school and university settings, Crook (1994 p79) talks of "the organised asymmetry of expertise (expert and novice; teacher and pupil)". In examining the effective use of educational technology in university teaching, Laurillard (1994 p3) talks about "the world the learner interacts with is necessarily a teacher constrained part of the world". This is not the world of most UK MBA programmes.

MBA programmes lie on a spectrum from the taught didactic, the Chicago model, to the vicariously experiential, the Harvard model. UK programmes adopting the Chicago model resemble the familiar taught MSc whereas in programmes following the Harvard model learning is experiential through the collaborative study of cases.

In most disciplines cases are studied as an example of practice, to give versimilitude to the taught material and to motivate learning. Havard style management cases are used as a starting point, so, for example, students are asked, how would you as production manager solve this problem? By answering perhaps several hundred such questions students face years of management experience and thus construct their own understanding of management processes (Carson 1971).

For any case, the class typically contains an "expert in the field", to use the words of an experienced lecturer on the Cranfield MBA programme, and it is not the lecturer. What is learnt from the other members of the team is seen as equally valid to anything that may be learnt from texts or lecturers. MBA programmes adopting the Harvard model

embrace team learning to exploit this expertise whether the programme uses full-time, part-time or distance learning (Cranfield 1994a, Cranfield 1994b, OUBS 1995).

Students typically work in small study groups and the programmes explicitly address the issue of effective collaborative learning.

An MBA study group will meet Schrage's criteria (1990 ch 11) for successful collaboration: competence; a shared, understood goal; mutual respect, tolerance, and trust; creation and manipulation of shared spaces; multiple forms of representation; playing with the representations; continuous but not continual communication; formal and informal environments; clear lines of responsibility but no restrictive boundaries; decisions do not have to be made by consensus; physical presence not necessary; selective use of outsiders for complementary insights and information; collaborations are dynamic relationships that end. Though Schrage emphasises task focus, the 'enjoyable and developmental' but non-academic out comes of cooperative learning described by McConnell (1994 p15) are regarded as one of the most valuable benefits from such MBA programmes.

The MBA is also a commercial product; a "vocational qualification to academic standards" in the words of the Council of University Management Schools. The 1991 CNAA review reported that 47% of students quoted "improve job opportunities" as their reason for taking an MBA as against 16% who quoted "intellectual stimulation". With some 21,000 students taking MBAs (in 1994/95) and fees (1995/96) of up to £20,000, this niche market is competed for by over 80 institutions (Slack 1995).

With the personal computer seen as an "essential management tool" (OUBS 1995), computer support is an integral part of the package a business school sells. Phrases such as "all MBA courses encourage use of the ... conferencing system which allows students to communicate with one another, with tutors, and with guest subject experts", "use the time spent at ... more effectively through computer based learning"

and "keep up with the 'state of the art' in computing in a business environment" are to be found in 1996 MBA prospectuses. Are these claims really about improving the learning process or do they derive from commercial concerns?

Dearing (1997 13.1) believes that 'the innovative exploitation of Communications and Information Technology (C&IT) holds out much promise for improving the quality, flexibility and effectiveness of higher education'. Within management education there have been a number of high profile experiments with the use of technology to support collaboration through the use of groupware products and to support cases by the use of multimedia. Such developments are often expensive and focus more on the technology than on the underlying nature of the collaborative learning embodied in case based programmes. While such experiments are reported as successes there is little work on the integration into the typical case based MBA programme. For example, Dearing (1997 annex 13) found that the while the Havard Business School intranet system was impressive it included few teaching applications and requires further work.

Personal experience of introducing comprehensive computer mediated communication to the Cranfield part-time MBA programme in 1988/89 (Sweeney and Oram 1992) came almost from a different era where it was seen as legimate to focus on introducing students to technology. Nevertheless there was an interest in how the technology impacted on the learning process and there were indications that the results of research on computer support of learning in other university disciplines did not apply. This experience is supported by anecdotal evidence from colleagues in other institutions and arises because of the differences between student learning on case based MBA programmes and traditional academic disciplines.

A review of the literature (chapter 2) confirms that although there has been substantial research in computer supported collaboration very little of this is relevant to MBA students. Thus this research aims to examine the actual use of computer support by

MBA students in collaborative case based learning and to consider the impact this has on the efficiency and effectiveness of their learning.

The research agenda is established in chapter 2. The subset of UK MBA programmes that use case based learning is described. These programmes use a three stage model involving individual, group and class discussion to enable students to learn collaboratively from the vicarious experience of a case. A discussion of the learning styles embodied in this model leads to an extension of Laurillard's (1993) 'conversational framework' to recognise the dual role of students as both learners and experts. The limited work that has been done on evaluating the computer support of case based learning by MBA students is used to define the boundaries of this research. Support for both the substance and process of learning is considered, recognising the nature of the learning implied by the three stage model.

The lack of underlying integrated theories and the desire to study actual use rather than use in the artificially constructed world of experiments mean that this research uses an exploratory approach. This approach is based on the holistic-inductive paradigm which leads to theoretical propositions. Chapter 3 also justifies the use of the research[1] case study as the research approach and discusses the research criteria of utility and goodness applicable to this paradigm. This depends upon the interpretation of qualitative data being consistent with the world views of the participants and the results being credible to directors and tutors of case based MBA programmes. In this context the experience of the researcher is highly relevant.

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[1] The term research case study is used here to reinforce the difference between usage of the term case study in the two separate areas of research and teaching.

In 1986/87 I took the full-time MBA programme at Cranfield School of Management. Subsequently I joined the faculty and lectured to the full-time and part-time MBA programmes between 1988 and 1992. During this period I chaired the School's IT Committee and was responsible for the introduction of a number of IT initiatives including the introduction of the computer mediated communication referred to earlier. The structure of the core course had not changed substantially by 1995/96 so I was well placed to understand the world views of full-time students and faculty.

Cranfield's reputation in the UK MBA market, its strategic use of case based learning and my connection with the School led to it becoming the first of my research case studies. Three investigations were designed to explore the full-time students' attitude and use of computer support. The attitude investigations involved two questionnaires distributed to all students, one using a standard instrument and the other open-ended questions. The behaviour investigation used a quasi-experiment involving two minimalist computerised resource based cases to make computer use more visible. Data was collected by videoing study groups and lectures. These investigations are described in chapter 3.

Despite my connection with Cranfield there were difficulties associated with negotiating access and conducting the investigations. These arose because of the commercial nature of the programme and practical problems of recording study groups and lectures. However the response rates to the questionnaires were good and the behaviour investigation revealed an interesting dissonance between the attitude and behaviour of the Cranfield full-time students to computers. The conduct and findings from the investigations are contained in chapter 4.

The dissonance between attitude and behaviour identified in the full-time Cranfield MBA students led to the development of two further investigations concentrating on the attitude and subsequent behaviour of different groups of MBA students. The Cranfield

part-time MBA has used computer conferencing and electronic mail since 1989 to support the students when not on campus. Including this as a complementary research case study allowed the use of computer conferencing to be investigated. As the two programmes are very similar in all but study mode, direct comparison of the two attitude investigations was also possible. This revealed no significant difference in the measure of attitude to computers. The conduct and findings from the investigations are contained in chapter 5.

The similarity of attitude scores between the full-time and part-time Cranfield students led to the consideration of the Open University MBA in order to investigate the attitude of distance learning students. The core course aims to be comparable with other UK MBA programmes (OUBS 1994). The opportunities for collaborative case based learning are provided through a one week residential summer school. One of the two cases is a computerised simulation. After the residential school this continues using computer conferencing.

My involvement with the Open University MBA arose from a report I was commissioned to write in 1994 on computer support of the new fast-track core course for their distance learning MBA. This led to an involvement in the training of tutors in the use of computer conferencing and being a lead tutor on the computerised simulation at two of the 1996 residential schools. During the development I got to know the faculty and so could appreciate their world-view but had less insight into the student view.

A study of the two residential schools in 1996 became the second complementary research case study. The standard attitude investigation was repeated with this student body and a new investigation looked at the computerised simulation. However, as this was the first year of a new flagship course, the students were already being heavily surveyed and in consequence investigations were severely limited. The conduct and findings of both investigations are contained in chapter 6.

The conduct and quality of the research is evaluated in chapter 7. The findings from the research polarise into the differences between the MBA students' attitudes to computers and their behaviour when using computers to support collaborative case based learning. Taking these two perspectives, chapter 7 discusses the findings from each investigation highlighting the similarities and differences between the research cases.

From the findings of the investigations, six propositions are posited. Assessment against the research criteria shows that some of these have been established and apply to any collaborative case based learning in UK MBA programmes while others indicate the need for further research. Thus chapter 7 demonstrates that the research agenda has been met by increasing the understanding of collaborative case based learning by MBA students. The thesis concludes by discussing the implications for the design and delivery of case based MBA programmes.

2 Research agenda

This chapter identifies areas for computer support of collaborative case based learning by MBA students and by looking at existing work defines a research agenda.

Section 2.1 describes the development of the UK market for MBAs and distinguishes the subset which may be described as case based MBAs. The most widely used case based learning approach, the three stage model is presented. Section 2.2 uses Burgoyne and Stuart's classification of learning theories to position the case based MBA. This leads to a discussion of the learning styles embodied in the case based approach and an argument that the most appropriate model is Laurillard's 'conversational framework'. This framework is extended to apply to case based learning by MBA students.

Section 2.3 outlines the computer support that is possible for both the substance and process of case based learning. One aspect of support for the process in which there has been substantial research is computer supported collaboration. Section 2.4 identifies those aspects of the research that are relevant to case based learning by MBA students.

The research agenda presented in section 2.5 draws upon the limited work that has been done on evaluating the computer support of case based learning by MBA students, to define the boundaries of this research.

2.1 UK MBA S

The MBA in the UK emerged in the 1960s. The Franks Report (Franks 1963), the setting up of London and Manchester Business Schools and the conversion of existing management programmes to deliver MBAs all stem from then. The objective of the UK MBA was to deliver 'increased managerial competence rather than the achievement of

academic prowess' (Sweeney and Oram 1992) for, as Franks noted, business management is 'an intelligent form of human activity; not intellectual, nor academic, but practical in nature' (1963 para. 6).

However, the MBA programmes were by no means identical. As Wensley (1995 p10) documents:

'The particular offerings reflect the influence of two rather different notions of a taught postgraduate course: the first essentially came from observing the then current practice in the USA and broadly consisted of *the two year full time model*; the second was the already established UK (and to some extent mainly European) approach to taught Masters programmes, which consisted of a full 12 months with a significant dissertation as the final stage.

While the overall market has evolved and developed very substantially since the 1960s, the curriculum choice that is available still reflects both these two rather different traditions and now, of course, a number of intermediate or *accelerated* options which lie between the two.'[1]

In addition to these differences in curriculum tradition, the method of delivery also varies with full time, part time, distance, in-company, consortium and open MBA programmes available. In all Slack (1996) is able to list 78 UK schools offering 190 different MBA programmes (plus other specialist management masters courses) to 'at least 21,000 people' (p10). He reports that for 1994/95 enrolments, 17.3% are full-time, 33.9% part-time and 48.8% distance learning.

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[1] Wensley's italics

Given the role of computers in managerial life and the space devoted to computers in the prospectuses of most MBA programmes, one might expect to find evidence of considerable computer support. However this seems not to be the case. In 1994 Nicholson and Williams (1994) surveyed 107 (responding) academic departments in institutions that offer degree courses in accounting and business in the UK. They asked departments to identify the computer packages used within various categories (eg databases). Only word processor and spreadsheet packages were used by more than 50% of departments; in all other categories more than half of the departments replied 'none'. However, this survey did not distinguish between postgraduate, post-experience and other use.

In contrast a 1987 survey of 'computerized business and management simulation games (business games)' in the UK, Burgess (1991) found 56% of 162 responding academic institutions used computerized business games. The survey report compares the UK findings with a similar study conducted by Faria (1987) in the USA. Burgess concludes that 'both surveys indicated high use of simulations in business schools and allied environments' although he gives no breakdown for UK business schools.

The teaching methods adopted by MBAs in the UK vary considerably but 'it is fair to note that in general teaching approaches have moved towards the interactive with greater use of group work as well as simulations and other exercises' (Wensley 1995 p11). This is embodied in a form of case-study teaching unique to management education which is found in some form or other in most UK taught MBAs. In some MBAs it is the dominant approach while in others case study teaching complements other methods.

2.1.1 Case method in management education

The case method in management education dates back to its introduction at the Graduate School of Business Administration at Harvard University in the early 1920s.

This follows the appointment of Wallace B Donham as dean in 1919. As Towl (1969 p6) notes

'The new dean, having been trained as a lawyer in the case method, was convinced that a similar development of written cases would make the new Faculty of business administration more effective'.

For a lawyer at Harvard at that time 'case' had a particular meaning. Lombard[2] talking to the Visiting Professors Case Method Program at Harvard in the fifties and sixties is reported as saying (Towl 1969 p182-183):

'It was the Law School's tradition we inherited. I am told prior to and during the early 20's, when these steps were being taken here, the emphasis of the training at the Law School was on the handling of a brief for an appeal. That is, the cases discussed were the decisions of lower courts being appealed to higher courts. In this framework, the investigation of the facts of a case had usually been completed. In this respect, the findings of the lower courts could be taken as given. The important thing for the student was to argue to a decision in the light of precedent on the basis of known facts and of course in accordance with justice. Thus the method of instruction was oriented away from the inquiry which the lawyer to whom the client first brought the case had to make and towards the decision the appellate judge was being called on to make.'

This framework continues to this day. The Harvard management case provides all the information needed for the student to analyse the case. While no further investigation is needed by the student, some cases do come in parts to reflect the passage of time or different stakeholders' viewpoints.

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2 Professor George FF Lombard, Senior Associate Dean for Educational Affairs at Harvard Business School (1969)

Thus although deriving from the law school model of case based teaching the MBA approach is now significantly different. It also differs from the clinical case and the related techniques of problem based learning used in medicine.

The emphasis in the literature on Harvard's use of the case method is about how to teach with cases[3,4]. As Copeland (1958) said 'Much of what Harvard Business School represents has never been interpreted in words: our practice, values, and traditions remain oral.'

In the UK, the major provider of management cases, the European Case Clearing House (ECCH) publishes advice on 'management teaching using case studies' (Heath 1988). In this video, Constable's[5] view (21:06) of the process is:

'[The students] should read and work on the case on their own and depending on the subject taught that may involve a fair amount of numerical analysis or it may involve much more determining and expressing ideas about a particular problem. The second stage would then be what is often known as a syndicate group or study group and that would involve about half a dozen people who belong to the course sitting down and spending, perhaps, up to an hour discussing the problems - really trying to refine their ideas. And then of course the third stage is in the classroom which, again, can be run in a whole variety of ways depending on the scale of preparation that has gone on before.'

The model described by Constable and summarised in figure 2.1 is widely used within the UK. There are variations in the model which may include providing: readings on

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3 Christensen's 'Teaching by the case method' (1987) is a good contemporary example.

4 There is separate literature on the use of cases in research.

5 Professor John Constable, co-author of The Making of British Managers

management theory or practice; further information about the case on request; or guidance on the method of problem analysis (Sweeney and Oram, 1992).

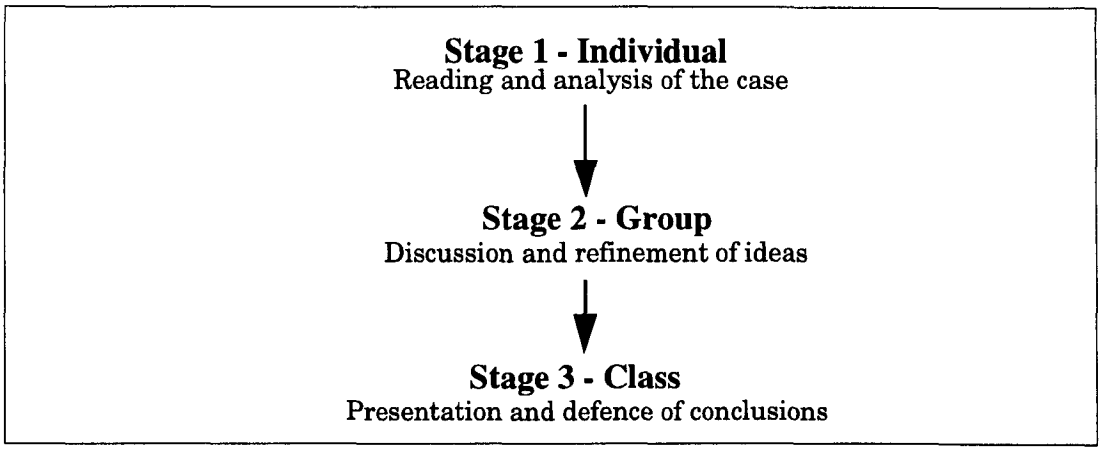

Figure 2.1 The three-stage case based learning model

While no further investigation is needed beyond the case, what is learnt is not limited to the case. In a well constructed programme, the learning from one case enhances the analysis of subsequent cases in the manner of the Dewey spiral (Kolb 1984). In addition, as Constable comments (Heath 1988 12:07):

'One of the advantages in my view of the case method for the student is that they do have to learn to talk in front of their peers, to express views, and to support those views. And some people find that quite difficult. So they're not only learning about the subject matter, they're actually learning about the art of verbal communication and expression which for a manager is one of the most important skills they can possibly have.'

2.1.2 Case based MBAs

Professor Robert Merry, then Director of Case Development at Harvard, gives the rationale for case based MBA programmes when he says (Carson 1971) 'We face the MBA student with as many problems as he will meet in a lifetime ..., so that ten years later, the graduate intuitively draws on what he has learned from this vicarious experience when faced with a similar business problem.'

Beyond this, post experience MBA students can learn as much from their peers as they do from their teachers; 'often sitting in the classroom is hundreds of years of experience' (Constable in Heath 1988 02:22). This experience is used both in the second and third stages of the case method through group and class discussion of a case. In a study group discussion, the roles of teacher and student will differ from case to case and may even change within a case. A banker may be the teacher in a finance case but may give way to a student with a personnel background if the case includes laying off staff. In other words the study group is operating like a senior management team.

The ability to contribute to group discussions is essential for an MBA student. This leads to the near universal UK MBA entry requirement of a minimum two or three years 'relevant management experience'. Some business schools, such as Bath School of Management, The Open University Business School, or Ashridge Management College require a minimum of five years experience as a manager. This results in average ages for MBA students of 27 (full-time) and 35 (part-time) (Slack 1995).

For managers (or other professionals) with substantial experience, the vicarious approach of case based MBAs is less appropriate. A limited number of action learning MBAs which focus on the individuals' own present and prior experience cater for such students.

This research focuses upon case based learning by students within UK MBA programmes. This collaborative learning is characterised by Constable's three stage model as summarised in figure 2.1.

2.2 LEARNING THEORIES OF CASE BASED MBAS

Faced with even greater diversity of 'manifest programme characteristics' in the management development field as a whole, Burgoyne and Stuart (1977) used a model of

how learning theories are embodied in programmes to compare learning theory with learning outcomes. They view this as 'similar to Argyris' distinction, for individual people, between "espoused theory" (what people say they believe, or are doing) and "theory in use" (the theory or principles that are consistent with what they actually do)'. Their research looked at a number of management development programmes including two masters programmes.

Burgoyne and Stuart categorised the schools of thought on learning theory as shown in figure 2.2.

Burgoyne and Stuart's (1977) analysis allowed them to conclude (p10) that 'learning theories employed, explicitly or implicitly, can be usefully described at three levels: philosophy, strategy and tactics/method'.

A programme will belong to just one 'school of thought' at the philosophy level. This is manifest as the 'psychological contract' with the student. For example, where the programme aims to initiate the student into the role of senior manager the philosophy would be one of social influence. Burgoyne and Stuart suggest that this contract is signalled from the first contact with the student.

At the strategy level, however, several schools of thought may form an overall sequence that the programme passes through. A programme may start with a 'social influence' induction process followed by a 'cognitive' period of developing new ideas leading to an 'experiential' period of trying out the ideas.

At the tactical level, a phase of the programme may be implemented using a range of learning theories. An amount of conditioning in, say, accounting conventions may be necessary before any information transfer or cognitive process can take place.

School of Thought	Model of man	Metaphor	Applications
Conditioning	Habit system	Telephone exchange	Rote learning programmed learning, language laboratories,
Trait modification	Set of characteristics	Tool kit	Profiles, training needs by subtraction
Information transfer	Information store	Library or filing system	Syllabus based methods. 'Telling' methods
Cybernetic	Information processing/decision making/controlling mechanism	Complex computer	Simulations, technique tell/test
Cognitive	Experiencing person	Navigator with a personal map	Learner centred/ problem centred discussion, reflection
Experiential	'Whole person' agent not patient	Like us	Structured exercises, learning community
Social influence	Person as socially defined entity	Actor with rights and responsibilities	Induction processes, rituals of role passage. Some role playing
Pragmatic	The belief that learning is 'common sense', that there is no theory		Selection of methods that appear to 'work'. Some case studies and some project work

Figure 2.2 Schools of thought on learning theory (adapted from Burgoyne and Stuart (1977) p8)

Burgoyne and Stuart's limited examination of management development programmes found that masters programmes followed a model of

philosophy - social influence

strategy - social influence / cognitive / pragmatic or

social influence / information transfer / cognitive / pragmatic

tactical - social influence / information transfer / cognitive / pragmatic

In so far as a business school's philosophy and strategy are manifest in its prospectus and similar literature the model Burgoyne and Stuart found is still dominant in UK MBA programmes (see Slack (1995)).

Within this categorisation the case based approach is positioned around the cognitive school at the strategic or tactical level. Although individual case studies of best practice may fall within the pragmatic school, the case based approach described in the previous section does not. At a strategic level case based learning may be the dominant approach for some or all of the programme whereas at the tactical level it may just be used within individual courses as a means teaching specific concepts. In keeping with Burgoyne and Stuart's findings, the use of the case based approach is not described at length in MBA prospectuses because they focus on the programme's philosophy.

The next section develops an appropriate model of learning for the case based approach in MBA programmes using established models from the cognitive and experiential schools of thought.

2.2.1 Models of learning

Kolb's theory of experiential learning (Kolb 1984) is 'by far the most popular' (Henry 1989) even though the 'Kolb cycle' (figure 2.3) is actually Lewin's (Kolb 1984 p21) and the idea that the cycle is repeated is Dewey's (1938) (Kolb 1984 p 23)!

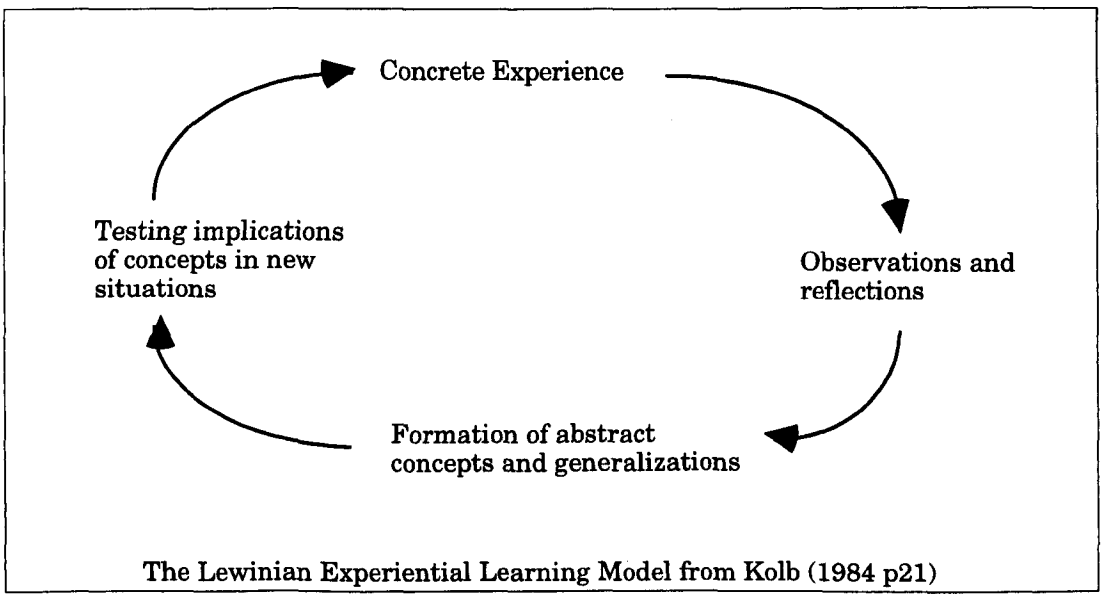

Figure 2.3 Kolb cycle

This model is based on the idea that the individual learns from experience within a cycle of reflection, abstraction and practical experience. The Kolb constructivist model is inadequate to describe case based learning because it ignores the social influence of either tutor or fellow students (Crook 1994).

The Kolb cycle is extended by Laurillard (1993) in her model of university teaching. She draws on Ramsden, Pask, Vygotsky and 'Socratic dialogue' to develop a 'conversational framework' (p102). In this framework, an academic dialogue takes place at two levels: a discussion of conceptual knowledge; and an interaction between the teacher's constructed world and the students' experiential knowledge. The interaction can be either with a physical representation of the teacher-constructed world or by way of a 'thought experiment'. A simplified form of the model (Laurillard 1994) is shown in figure 2.4.

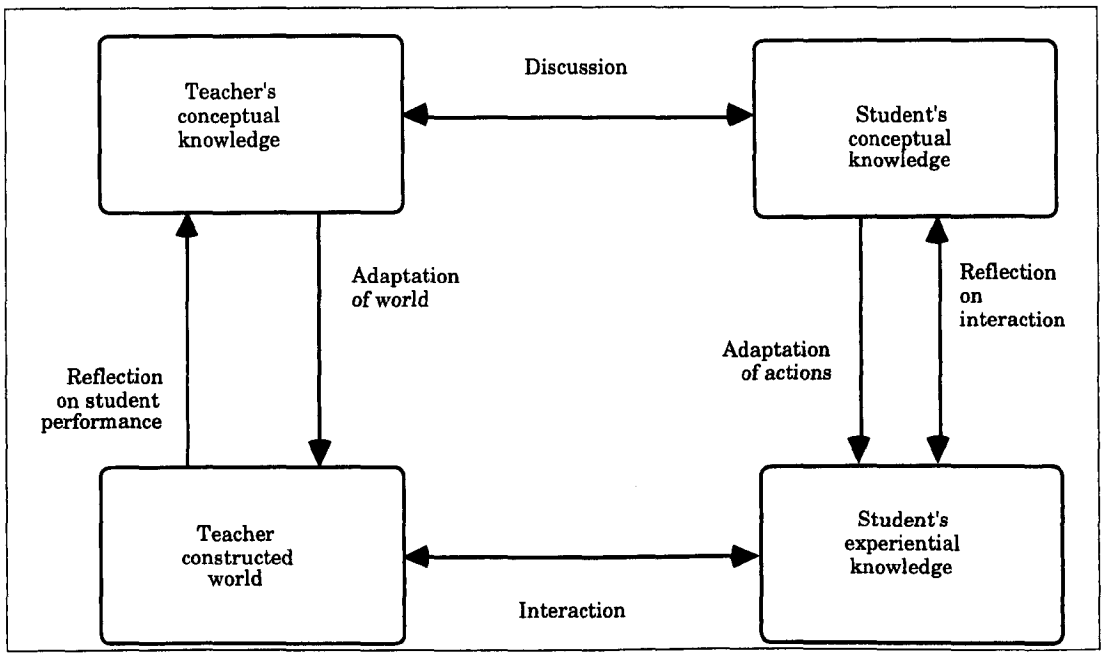

Figure 2.4 Essential aspects of Laurillard's conversational framework

The model is expressed in terms of the individual student and is asymmetric in its representation of the student and teacher. The student's experiential knowledge arises

from an interaction with the world that the teacher constructs in order to teach. The cycle of events on the student side corresponds to Kolb's cycle.

All aspects of the model are present only in the tutorial where learning is through guided discovery and tutor and student are collaborators (1994 p5). Laurillard considers collaboration between students but her view of collaboration is that 'student-student discussion undoubtedly has some important educational characteristics, but in comparison with the aspects of the learning process [she] suggested were essential, it addresses rather few' (1993 p171). Given her focus on the student body as a whole this is perhaps reasonable but it ignores the post-experience study group in which the importance of collaborative peer group learning is well established. In this context the concepts of collaborative learning (Kaye 1992) that are most applicable are those that relate to peer exchange and the social process by which individual understanding is shaped by interactions within the group.

Laurillard's model can be extended to case based learning by post-experience students. Within each of the three stages the role of tutor is taken by different actors. The role of tutor rotates from the case writer or teacher; to the student who is leading the case within the study group; to one or more subject experts within the study group; to other experts within the class; and returns to the teacher in class. The student's interactions with these various constructed worlds is shown in figure 2.5.

The Kolb cycle that the student experiences is retained. Within the study of a case, in the first stage the student individually interacts with the case and discussion is in one direction from the teacher/case writer to student. In the second stage discussion takes place between students in a study group; the interaction is with the constructed worlds of the case leader and more experienced student. In the third stage the discussion is between the students and between the teacher and the students; the interaction is with

a constructed world that is an amalgam of the case, the teacher's world and the worlds of more experienced students.

The cycle of reflection and adaptation between the teacher's conceptual knowledge and constructed world in Laurillard's model occurs whoever is playing the role of tutor. If this is to work then not only must the teacher be able to reflect on student performance and adapt their constructed world accordingly but so must the experienced students.

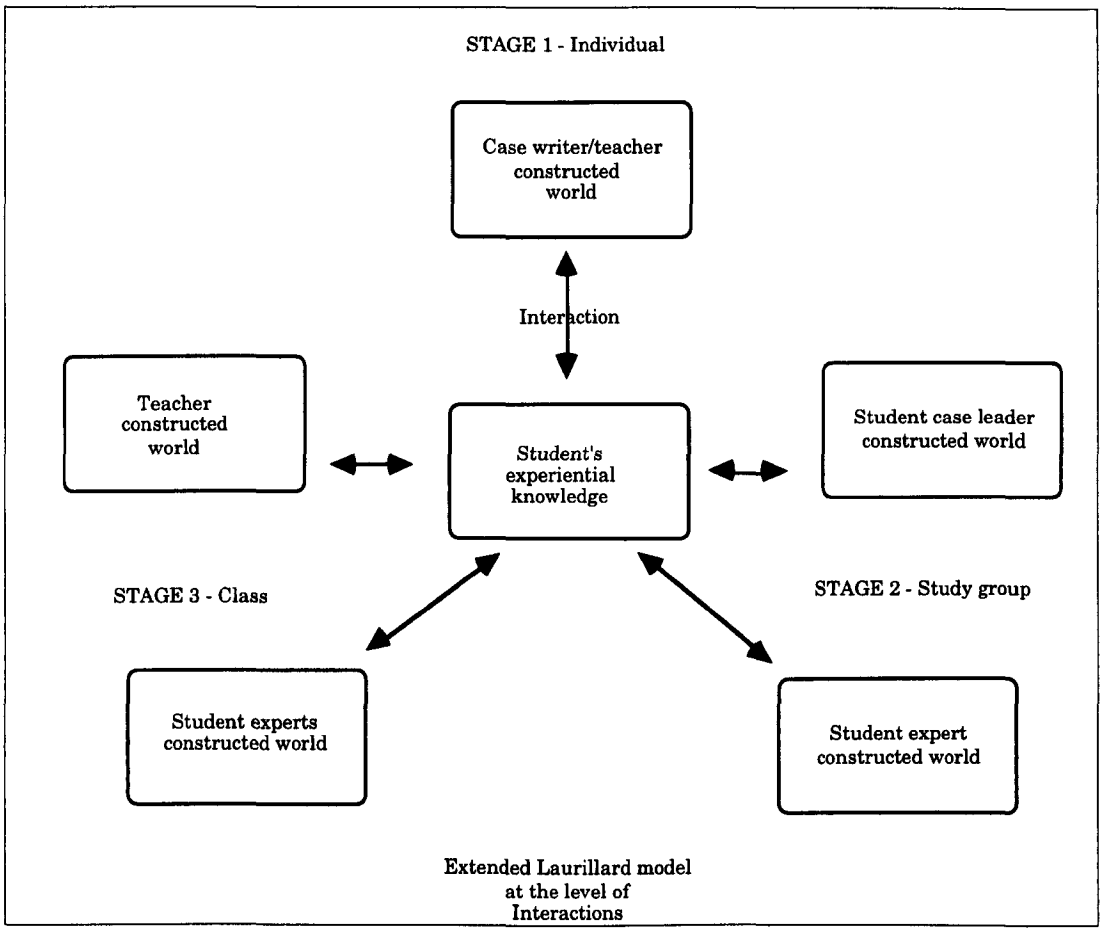

Figure 2.5 An extension of Laurillard's model to case based learning

In studying such case based learning it is therefore necessary to take note not only of the learning styles of the students but also their teaching styles. Two of the dimensions of the Myers Briggs Type Indicator (MBTI) (Briggs Myers 1987) allow one to do this. The MBTI identifies sixteen types by classifying individuals on four dimensions:

extraversion - introversion (E-I); sensing - intuition (S-N); thinking - feeling (T-F); and judging - perceiving (J-P).

The second, third and fourth dimensions identify temperament type and so learning and teaching styles (Keirsey and Bates 1984). These styles can then be contrasted (Norris 1991) to give a view of how the individual will act in a study group where the roles rotate. The four combinations identified by Keirsey and Bates with their preferred teaching and learning styles are shown in figure 2.6. This indicates that for the student successfully to adopt an expert role within the extended Laurillard model of case based learning types SJ and NT will be more effective. The potential conflict between these types should be noted.

Temperament type	**Teaching style**
SJ	expect learners to obey the rules, well planned, clear sequential presentation, not very empathic - less patient with non-conforming learners (such as NT or SP)
SP	interested in development of spontaneity so may do the unexpected, 'star' performer, focus on communication between teacher and student, avoid areas which are more theoretical, best with practical hands-on skills
NT	may go too fast for majority, use problem centred approaches but impatient if classroom discussion moves off topic, encourage rational exploration, likely to look for new ways with existing content
NF	personal charisma, commitment to individual learner, willing to allow student-student activity and do not see themselves as a source of all wisdom, prefer to create their own materials, prefer interactional style

Figure 2.6 Preferred teaching style of different temperament types

Laurillard uses her model to discuss the extent to which various forms of technology have supported the learning process. However that aspect of her work is not particularly relevant to this research because of the strong focus on the individual undergraduate.

This section has positioned case based learning at the strategic and tactical level of MBA programmes. It has developed an appropriate learning model based on an extension of Laurillard's conversational framework. This has highlighted the student-tutor duality of a study group member and suggests that both the learning and teaching styles of students need to be considered.

2.3 COMPUTER SUPPORT OF CASE BASED MBAS

In MBA programmes a variety of approaches to computer support are found. Both the substance and process of the case method can be supported by computers (Oram 1998). The substance can be supported by the computerised case. The process of learning from a case can be supported by a range of tools: analytic tools for the student; collaboration tools (or groupware) for the group discussion and decision; and meeting support tools for the class presentation.

2.3.1 Computerised cases

The Top Management Decision Simulation of 1956 is an early example of a computerised case. This computerised case or business game as it is more commonly known, was developed from the idea of the "war game" (Tansey and Unwin 1969). However, players of chess might argue such developments have a much longer history. Here the information available to the students for analysis is determined by the students' previous decisions. The computer allows the rules to be more complex than a paper version. It can be argued that this makes the case more realistic and so relevant to management education. Computerisation also allows more decision cycles in a given time-span and so more opportunities for the student to go through cycles of reflection and experimentation (ie have the opportunity to learn from experience).

More recently the combination of the CD, the PC and the LAN technologies have given rise to a second form of computerised case. This form is known as the multimedia case or perhaps more accurately the resource based learning case. The concept can be extended to provide a virtual business environment (Angehrn et al 1993).

In the resource based case the student is presented with a vast amount of data from which the relevant information has to be sought, selected and (re)ordered. This supports the management teaching technique of obliging the student to be selective by providing more data than can be analysed by the deadline. Before computerised cases this was, perhaps, a rationalisation of poor case writing technique rather than a true teaching technique. However the skill of finding the relevant information in a vast amount of valuable, but in this instance irrelevant, information is an essential managerial skill.

The number of computerised cases actually in general use is still small. In comparison to the many thousands of paper cases available from Harvard only a small proportion are available in computer readable form. ECCH for example has (in 1996) less than two percent of cases that are formatted for computer use as distinct from cases with some supplementary material in computer readable form. Harvard are developing a series of interactive multimedia case studies the first of which was due for release in 1997 (HBS 1997).

2.3.2 Computerised case learning

The three stages of the learning process described by Constable are used in figure 2.7 to identify the various elements that can be computerised (Oram 1996a).

In the first stage, the individual student analyses the case with some resort to other students in the group and perhaps a tutor, for clarification. The elements that can be supported are:

annotation;

manipulation of data, especially numeric data;

manipulation of simulations; and

exchange of question and response messages including extracts and annotations.

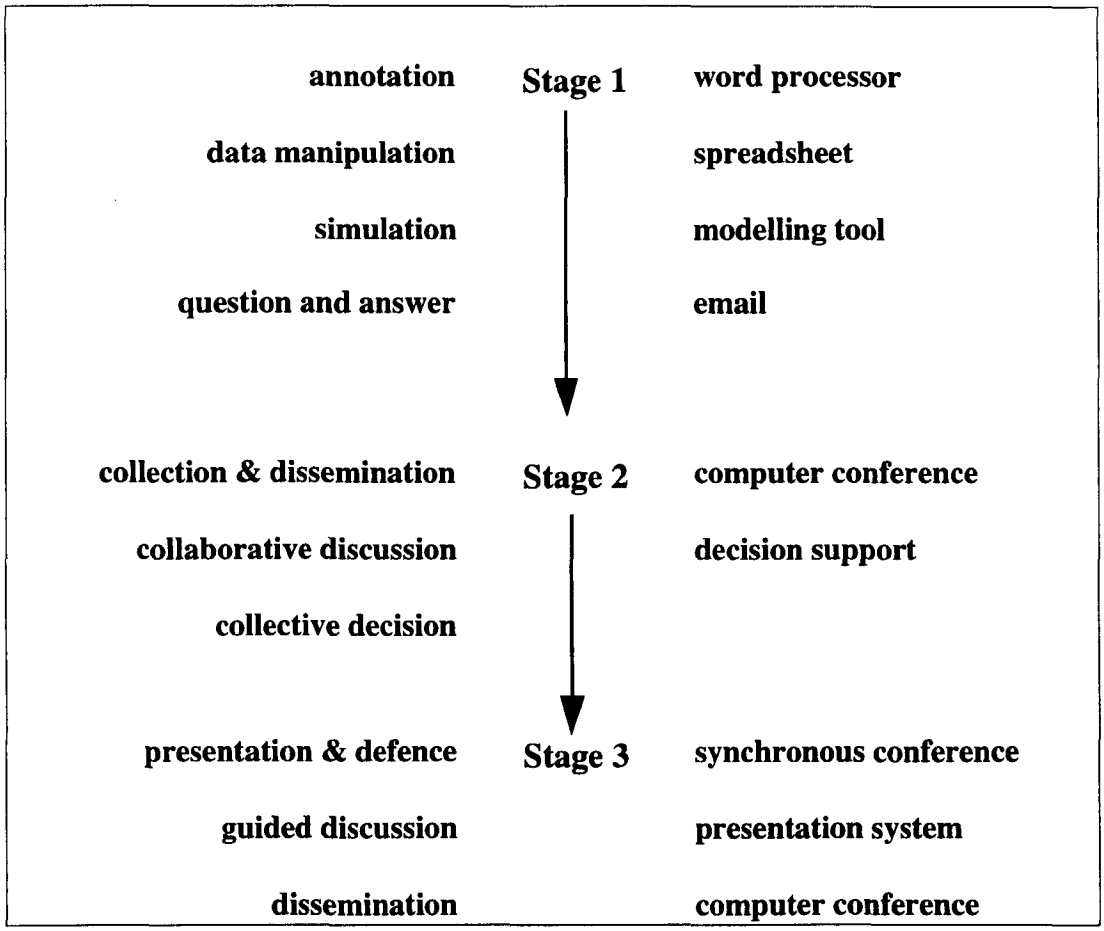

Figure 2.7 Computer support of the three stage model of case based learning

The computer support consists of spread sheet, word processor, email (with the ability to support spreadsheet and word processor attachments) and the relevant simulation package. For multimedia cases the relevant media viewer plus corresponding email capability is also needed.

The objective of the second stage is to ensure that all the relevant aspects of the case have been looked at and possible actions identified. To be able to recommend a particular action is desirable but may only be appropriate if there is enough information in the case. The emphasis switches from the essentially individual work with limited collaboration of the first stage to essentially collaboration with limited individual work. The elements that can be supported are :

collection and dissemination of individual views;

collaborative discussion; and

collective decision on recommended action.

The support needed here is a computer conference and some form of decision support.

A conference is appropriate rather than email because there is a focus for the discussion and it is bounded by time (from when the case is first analysed to when it is presented). However, given an email package capable of sorting incoming messages on the basis of the 'Subject:' line (or equivalent), email could be used just as effectively by a study group.

There is also room for a group decision support system (GDSS) but in a week a full time MBA student may have to consider over twenty cases so a full GDSS may not be suitable where so many decisions are needed. GDSS have developed from a background of supporting high level complex decision making processes which require a definitive outcome. A case may be about hiring a junior employee and the outcome may be two diametrically opposed views. In this situation a computer conference may be adequate with the moderator for that case, one of the study group students, posting the decision(s) at the end of the discussion.

Groupware packages offer, or purport to offer, support for all the elements of the stages one and two. However, for students who are taking a management course, rather than

say an information technology course, the effort of learning how to use the package may outweigh the benefits. To an IT student a groupware package is of interest and worthy of study in its own right but to a management student it is just a tool.

The third stage is the presentation to the class by an individual student (or small group of students) and class discussion under the guidance of a tutor. There may also be supplementary information provided by the tutor at this stage. The elements that can be supported are :

presentation and defence of the analysis and recommended actions (if any);

tutor guided discussion;

data dissemination.

At this stage synchronous conferencing or face to face discussion may be relevant. If students are to defend their analysis the technology may be a limiting factor. A class of six study groups may contain some forty students. Neither audio or video conferencing can, at present, support a vigorous debate amongst so many students. So, the tutor's role as mediator would be a critical factor at this stage of the learning process.

Use of a presentation system may be appropriate but the number of cases to be dealt with would mitigate against elaborate use. Any additional information can be disseminated using email or a computer conference.

The preceding identification of elements that can be supported by computer makes no distinction between the various types of management education programme that use the case method of learning. The full time residential programme will almost certainly favour face to face class discussion. At the opposite end of the spectrum distance learning programmes make a feature of students not needing to be in the same place at the same time. However, wherever the programme is on the spectrum all the elements

are present and can be supported since they derive from the nature of case based learning.

2.3.3 Types of computer support applicable for case based MBAs

This section has demonstrated that there is a range of computerisation that is appropriate in the support of case based MBAs. This may be classified as computerised cases and analysis, collaboration, and meeting support tools.

Analytic tools encompass the traditional office products particularly word processor and spreadsheet. These are most likely to be used by students during stage 1 of the case method although it can be argued that they can also be used for decision support in stage 2 and dissemination in stage 3.

Tools for computer supported collaboration embrace electronic mail, conferencing and groupware (collectively computer mediated communication (CMC)) and have an obvious applicability during stage 2 but these tools also have a use during stage 1 when students are asking questions and during stage 3 as a dissemination mechanism. There has been considerable research into CMC and its relevance to this research is evaluated in the next section (2.4).

Meeting support includes presentation systems and where the meeting is not face-to-face, synchronous conferencing. These tools are applicable largely in stage 3 but may also be used during stage 2.

The computerisation of cases may affect all stages of the case method. Two distinct types of computerisation were identified. In the simplest form the material on a case is presented in a computer readable form often referred to as the resource based case. With the advent of multimedia, CDROM and network technologies there is the

opportunity to provide much richer sources of information. The other use of computerisation in cases is simulation.

2.4 COMPUTER SUPPORTED COLLABORATION

There are several overlapping bodies of research work in this area. This section identifies those which are relevant to this research.

Computer support of collaborative work (CSCW) in business is a well established field (for example Johansen 1988, Galegher Kraut and Egido 1990, Sproull and Kiesler 1991, Greenberg 1991, CSCW'94). However, in the context of this research, the area of computer support of collaborative learning (CSCL) is more relevant because CSCW is concerned with the efficiency of the task whereas CSCL is about how the task is carried out. Or as Heeren (1996 p20) neatly summarises: '

- CSCW aims at reducing mental effort
- CSCL aims at increasing mental effort (directed to learning, not with regard to tasks of secondary importance)'.

The different words 'collaborative' and 'cooperative' are often used interchangeably. Having noted the difference most researchers emphasise one or the other (eg Heeren 1996, McConnell 1994). Computer supported collaborative learning has either been seen as collaboration with the 'the teacher in the machine' (Lawless 1997) or collaboration with other students by CMC (Hiltz 1990, Kaye 1992).

CMC has been used to support geographically distant students (Mason and Kaye 1989, Harasim 1990) and to support 'virtual classrooms' (Hiltz 1986,1990, Paquette et all 1993) and 'virtual summer schools' (Eisenstadt 1994). While success has been reported it is usually with self selecting groups. This research is concerned with groups that are

not self selected other than at the level of having chosen a particular course at a particular institution.

However, Crook (1994) makes a useful distinction between four types of computer supported collaborative learning experiences. These are interactions: with computers; in relation to computers; at computers; and around and through computers. In interactions *with* the computer, the computer is the teacher (p82). Interactions *in relation* to computers are those 'done and said by teachers in support of their pupils' computer-based experiences' (p100). Interactions *at* a computer concern the situation where small groups work on the same computer based problem in the same place at the same time (p148). While the focus is the computer based problem, the interactions that form the basis of the learning experience are between the students. The interactions *around* (p190) and *through* (p194) computers are similar but without the common focus or without the common time and place respectively.

Thus Crook's work includes the asymeteric collaborations of 'teacher and pupil' and 'peer collaborations'. Moreover, in peer collaboration, the computer may be the stimulus for collaboration not just a means of collaboration.

So far this section has delimited those aspects of computer supported collaboration that are relevant to this research. That is support of collaborative learning by groups of students across a cohort with, at, around, through and in relation to computers. Specific research in this area with management students is covered next.

2.4.1 Computer support of collaboration in management education

In the UK an extensive amount has been written about the MA in Management Learning at Lancaster University (eg Hardy et al 1991). This work was early in the development of computer mediated communication (CMC) systems in the UK tertiary sector and informed much subsequent work (eg McConnell 1994). However, the MA was

a programme for post experience management teachers and trainers, not would be MBAs. 'Management learning is the study of (a) the learning of management and (b) the management of learning' (Fox 1994 p83) and should not be confused with either management studies, such as the MBA, or management as an occupation.

Contemporarily, CMC was used with part time and distance learning MBA programmes including Cranfield University School of Management (Myers et al 1989) and Henley Management College (Silk 1990) to replicate the face to face processes of full time programmes. Akehurst (1996) looked at the use of computer mediated communication as a tool in the delivery of the distance learning MBA at Henley. This study surveyed students on three programmes both before and after their use of the Henley Extended Learning Programme (HELP) system. The HELP system he studied (which was shut down in early 1994) was an email and rudimentary conference system based on teletext technology. The research focused on the use of the system rather than its impact on the learning process. He found that while it was a surrogate for face to face activities its success was limited. HELP was replaced with Lotus Notes in February 1994 (Galpin and Birchall 1996) but "Lotus Notes is not used by Henley to deliver courseware" (Lloyd 1996).

The advent of the CD-ROM has made resource based learning in the form of a mixture of multimedia tutorial and case material and some form of computer mediated communication, popular with distance learning institutions. The Open University, Henley Management College and Southampton Institute have pursued this route. The Open University developed a generic model (Alexander and Mason 1994) which has been used in several disciplines including education and management. In 1996, CMC

was combined with a collaborative competitive simulation[6] in the MBA core module. This is examined in chapter six. Henley offers a combination of tutorial resource, simulation and CMC (Henley 1997) to deliver an entire MBA programme at a distance, while Southampton uses a combination of CMC technologies to do the same (Jennings 1995)

In the USA, the American Association of State Colleges and Universities (AASCU) surveyed their members on their use and management of information technology (AASCU 1996). Two hundred and thirty institutions responded. They found that, for responding institutions, there was either a institutional requirement or a departmental requirement for business and administrative science students to be computer literate. However they also note 'data from a number of sources support the anecdotal evidence that the proportion of faculty who use technology for instruction as a matter of course remains at a level of 5 to 10 percent, regardless of numerous innovative projects to stimulate faculty involvement' (p11). Also, while email was virtually universal (99.5%), CMC systems such as electronic conferencing were 'now considered luxuries' though 'will be taken for granted in the campus-wide systems of the future' (p17).

In documenting their journey from a taught MBA programme to a learnt one, Boyatzis, Cowen and Kolb (1995) make little reference to the use of computer support. For example the following is the longest reference:

'The use of machine technology has always been an important component of the MBA experience at WSOM [Weatherhead School of Management at Case Western Reserve University]. However, the new program has increased the demand for tools to assist

---

[6] Study groups collaborate to manage a commercial organisation which competes for business with the organisations managed by other groups.

students in enhancing their knowledge and skills. Video, interactive software and teleconferencing are just a few of the technologies that are now in wider use at the school.' (p215)

It would seem that while technology is important to WSOM it is seen to be orthogonal to the development of the programme.

The one substantial study in the area of computer support of case based learning by MBA students is by Galegher and Kraut (1992). In a study of the effect of the communication medium on MBA students taking a managerial communication course, they looked at integrative versus divisible cases. In their experiment 114 first year US MBA students taught by Galegher were randomly assigned to three person groups. Following class discussion of a business case, each group had to "produce a complex document ... responding to the dilemmas presented [in the case] .. [within] a two week deadline " (p157).

Two cases were used:

an integrative case - "described an organisation facing a number of complex personnel problems. The students were to analyze these problems and recommend solutions in a report to management. The problems in the organisation were inter-related, and the most probable solutions, involved broad-scale organizational change reflected in a large variety of specific measures. Thus [the authors] believed that the likely approach to this assignment would be to work together to come to a decision about a general approach to these problems, as well as to design a coherent set of recommendations." (p158)

and a divisible case - " to write a multi-part report for the CEO of a medium-size firm concerning the issue of employer-sponsored childcare. The assignment required that the report contain a section summarizing the employees' concerns, a section reviewing possible approaches for responding to those concerns, a section

> reviewing state regulations for childcare facilities, and an executive summary encompassing the contents of these sections and recommending a course of action to the CEO. Each of the substantive parts of the report was to be a distinct unit, and the executive summary was to briefly restate the contents of those sections. Thus, [the authors] believed that the likely approach to this assignment would be to assign responsibility for each section to a single group member, and to work together only enough to generate the recommendations to be presented in the executive summary." (p158)

Half the groups were told that they must only use a computer mediated mode whereas the other half were free to use a computer mediated mode as much or as little as they wished.

They found, inter alia, that the amount of joint work was greater for the integrative case than the divisible case when the students were free to choose the mode of communication but the same for both types of case when a computer mediated mode of communication was mandatory. However, as with earlier work based on the same experimental model (Galegher and Kraut 1990), they found no difference in group performance even when the communication mode meant greater effort was required. In other words they found that, if necessary, MBA students work harder to complete the (assessed) task.

While the results may be of general application, their relevance to MBA students in normal team working circumstances has to be questioned. For example, they view effort only in relation to the tasks; no mention is made of effort expended on team formation. These groups would have had to spend time on group formation (Jaqcues 1991, Tuckman and Jensen 1977, Tuckman 1965) and it could be argued that the groups free to choose, spent the extra effort on team formation rather than on the task.

This section has considered previous studies of computer supported collaboration and found that the majority of the work does not apply to the particular instance of case based learning by MBA students. Those studies which look at MBA students tend to focus more on the use of technology than on the ways in which the technology supports the learning.

2.5 CONCLUSION

In the last thirty years MBA programmes have become established in the UK. The case based method of teaching (as described in section 2.1) is widely used and represents a learning approach which is peculiar to management education. This builds upon the expertise of the students by involving them as experts in their own right. This is summarised in the case based collaborative learning model presented in section 2.2. The case based MBA on which this research will focus is one where the case method is dominant at the strategic as well as the tactical level.

Section 2.3 outlines the considerable potential for computer support of case based collaborative learning. Although there is some evidence that computer support is widespread, hearsay indicates that this has had little effect on the learning process. Unfortunately, to date there has been limited research on how the overall package of computer usage supports collaborative case based learning. Given the unusual nature of the learning model that underpins case based learning, as explained in section 2.2, research into computer support in other forms of education has limited applicability (section 2.4).

So, this research sets out to understand computer support of collaborative case based learning by MBA students. The case based learning will be understood to follow the three stage model in figure 2.1. Section 2.3 describes the four types of computer support that will be considered: computerised cases and analysis, collaboration and meeting

support tools. Consideration will be given to both the substance and process of case based learning. The model used to understand the process of learning will be the extension of Laurillard's model for case based learning summarised in figure 2.5. This recognises the dual role of students in the MBA case method as both learners and experts.

This chapter has highlighted the absence of existing work and relevant theory for this research agenda. The process of case based learning embodied in the three stage model which uses students as experts requires an extension to established learning models. Moreover because of the unusual learning model much of the research on computer support of collaborative learning has limited relevance. The design of the substance of cases is largely based on oral traditions and as such their enhancement via computerisation has been little studied (Oram 1996a).

3 Research investigations

Chapter two established the research agenda of understanding computer support of collaborative case based learning by MBA students where the case method is based on the three stages of individual, group and class work. Support for both the substance and process of learning is to be considered recognising the unusual nature of the learning model implied by the three stage model.

Chapter two also demonstrated the lack of underlying integrated theories which means that this research uses the exploratory paradigm described in section 3.1. This section also justifies the use of the research[1] case study as research approach and discusses the research criteria of utility and goodness applicable to this research.

The three research case studies discussed in section 3.2 are used to enable computer support of collaborative case based learning to be studied for full-time, part-time and distance learning students following similar curricula. Within these three studies five investigations are conducted to understand the use of the different types of computer support described in chapter 2 (section 2.3). Section 3.2 discusses the objective of each investigation, the rationale for the choice of data collection technique and an explanation of the analysis procedure adopted.

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[1] The term research case study is used here to reinforce the difference between usage of the term case study in the two separate areas of research and teaching.

3.1 RESEARCH METHOD

Exploratory research seeks to discover 'context and time dependent "working hypotheses" (Cronbach 1975) leading to understanding' rather than 'context and time independent generalisations or laws leading to prediction and control' (Guba & Lincoln 1988 p94). Or to put it another way, it bases itself in the holistic-inductive paradigm rather than the hypothetico-deductive paradigm (Patton 1988, p128).

Several research strategies can be used within this paradigm but were deemed inappropriate for this research question. Informal conversations with MBA tutors indicated that they do not understand how computers support collaborative case based learning by their students. In this situation an open-ended survey of institutions was unlikely to succeed. Within the holistic-inductive paradigm, pure experimental research is unusual (Guba and Lincoln 1994). Moreover, experimental research can be misleading because of the instrumental nature of MBA students as encountered by Galegher and Kraut (1990). Consequently, a research case study strategy was adopted. 'A [research] case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident' (Yin 1994 p13).

'[Research] case studies, like experiments, are generalizable to theoretical propositions and not to populations or universes' (Yin 1994 p10). In other words research case studies are generalizable to Cronbach's "working hypotheses". In so far as this generalizability is a measure of the quality of the research, it is referred to as 'utility' in this paradigm.

The other hypothetico-deductive paradigm measures of research quality (reliability, objectivity and validity) correspond to 'goodness' in this paradigm (Marshall 1990). Tagg

(1996, 1997 p14) drawing upon Lincoln and Guba (1985), Easterby-Smith et al (1991) and Checkland (1981), condenses this into:

> 'are the results consistent within themselves and with an acceptable world-view of which I am a part';
>
> and
>
> 'is this an accurate representation within a publicly shared reality?'

These concepts recognise the subjective nature of this type of research and that the researcher is part of the context.

The publicly shared reality relevant to this research is that of directors and tutors of case based MBA programmes since it is intended that the findings will influence the design and provision of computer support in case based MBA programmes. Within the research case studies a number of world-views are present, in particular those of the academic staff and of the students. Of particular interest is the world-view of the students since it is they that do the learning. As explained in chapter one, these are world-views of which I have direct experience. Research case studies were partly chosen where I could best gain 'access to the knowledge and meanings of the informants' (Easterby-Smith et al 1991).

3.2 ESTABLISHING THE RESEARCH CASE STUDIES

As a former lecturer and student of Cranfield School of Management I was ideally placed to undertake a research case study on the Cranfield MBA. I would be attuned to the world-views of faculty and students. Moreover, I was fully aware of the politics and personalities involved and knew how best to approach the delicate subject of getting access. Being well-known by faculty also made it more likely that they would accede to my requests. Cranfield MBAs have a common bond and as such I was in a better

position to get co-operation from students in a course which is both extremely busy and emotionally exposing.

The Cranfield MBA is a good choice for this research because it is a large, established, and well-respected MBA which uses the case based approach almost exclusively during its first six month core course. The intake on the full-time programme of 180 students are taught as four streams with as near as possible identical experience. This provides some, very limited opportunity for quasi-experimentation. In addition, Cranfield also runs a part-time variation which extends over two years and is very similar to the full-time core course.

The full-time Cranfield MBA in 1995/96 forms the main research case study. Two complementary studies were undertaken using the Cranfield part-time MBA (1996 intake) and the Open University Business School MBA core course (1996 intake). These two studies were added to allow alternative delivery modes to be considered and to provide the opportunity to undertake some additional investigations.

In the Cranfield part-time MBA, the curriculum of the core course mirrors closely that of the full-time. Including this study allows for comparisons to be made between different intakes and modes of study. The part-time MBA has used computer conferencing and electronic mail since 1989 to support the students when not on campus. So this study also provided an opportunity to investigate the use of computer conferencing.

The Open University B800 course aims to be comparable with other UK MBA programmes (OUBS 1994). The opportunities for collaborative case based learning are provided through a one week residential summer school. The residential school centres around two large collaborative cases. One of these is a computerised simulation which continues after the residential school using computer conferencing. Although the tactical content of the syllabus is different to the Cranfield MBAs there is considerable similarity at a strategic level illustrating the commonalties found in MBA core courses.

A study of two residential schools (about 160 students) in 1996 allowed comparison with a third student body and mode of delivery and also enabled computerised simulation to be investigated. However, as this was the first year of a new flagship course, the students were already being heavily surveyed and in consequence investigations were severely limited. My relationship with the Open University MBA meant that I had reasonable empathy with the world view of the faculty, both central and tutorial, but a very limited understanding of what it means to be an Open University MBA student.

These three research case studies together provide within similar curriculum content a variety of study mode and student intake. Moreover they were all well-respected programmes with significant numbers of students. Compared with some other MBAs of a similar size and position in the market the use of computers in the research case studies was less well integrated with the course. Computers were regarded as part of the support infrastructure, rather like a library; students could make as much use of computers as they wished

My relationship with the faculty and to a lesser extent the students facilitated the studies particularly the Cranfield full-time study. However, Cranfield is a campus with an engineering bias and this was reflected in the somewhat positivist attitude of some former colleagues to my research work.

In each of the three studies, investigation was limited by the requirement imposed by the institutions to not disrupt the normal learning processes. As far as practicable, similar activities were undertaken in each study. These are described in the next section.

3.3 ESTABLISHING THE INVESTIGATIONS

Five investigations were designed to explore the MBA students attitudes and behaviour to computer support of case based learning. The methods available were dictated by the need not to interfere with or interrupt the students learning. Consistent with Yin (1994, chapter 4), data was collected using a number of different approaches. For, 'to the extent that their limitations differ, two methods can be better than one' (Reichardt and Rallis, 1994 p10). Yin's 'chain of evidence' is provided through the use of appropriate analysis techniques for each investigation. The choice of analysis technique is discussed for each investigation in the following sub-sections.

Section 2.3 identified four types of computer support that were relevant to the process and substance of collaborative case based learning by MBA students. The applicability of these in the 3 stage case method are summarised in figure 3.1. This table was used to inform data collection in the behaviour investigations.

Computer support	**Stage 1**	**Stage 2**	**Stage 3**
Analytic tools: word processor, spreadsheet	✓	✓	✓
CMC: email, conferencing, groupware	?	✓	?
Meeting support: presentation, synchronous conferencing		?	✓
Computerised cases: resource based, simulation	✓	✓	?

Figure 3.1 Potential for computer support of case based learning

3.3.1 Computer attitude survey

The use of computers in any stage of the case method will be affected by the students' attitudes to computers. The computer attitude investigation sought to establish how the students were disposed to computers at the start of each research case study. In particular, it was important to discover whether the support they obtained from computer use was coloured by a pre-existing attitude towards computers in some or all of the students. The computer attitude investigation was also a means of explaining potential differences between the three research cases studied.

Computer attitude scales are well-developed and validated especially in education (Gressard & Loyd 1986, Griswald 1983, Jones & Clarke 1994). Robertson et al (1995a) developed and validated an attitude survey based on these scales as part of a study of the use of pocket book computers in education. This was derived from a survey validated using post-graduate post-experience students (Gressard & Loyd 1985, Woodrow 1991). It assesses the subject's attitude to computers overall and on the seven sub-scales in figure 3.2. Robertson et al discuss the difficulty of theoretically justifying the distinctions between the sub-scales but found some experiential justification for them.

As part of their work, Robertson et al used the survey to test the attitude of the parents and teachers of the pocket book computer users. To provide a basis for comparison the survey was also used on post-graduate technical-management Open University students (Robertson et al 1995b).

Robertson's survey (see appendix A) was administered to all students in the three research case studies to allow cross-comparison of results. The computer attitude scales were calculated by averaging five-point Likert responses after reversing values for

negative questions and taking account of the one gender-sensitive question. The internal reliability was verified for the populations using SPSS[2] to calculate the alpha coefficient to indicate 'an acceptable level of internal reliability' (Cramer 1994 p278). The survey presumes a reading age of ten years so even for students whose first language was not English this should not have been an issue and in the event no difference was found.

Anxiety - how people feel about computers

Confidence - how well the person is likely to do working with computers

Cognitive - people's beliefs about learning and understanding with regard to computers

Behaviour - intentions about working with computers

Liking (enjoyment) - degree of perceived enjoyment from using computers

Use - computers and their effectiveness particularly in education

Competence (no prior validation) - respondent's assessment

Figure 3.2 Description of the computer attitude sub-scales (from Robertson et al 1995a pp75-76)

3.3.2 Computer support of case based learning

This study was designed to establish the students' opinions on how computers could support case based learning. Open-ended questions were deemed most appropriate because the study was exploratory rather than quantitative. Limitations imposed by Cranfield meant that interviewing students was not an option so a questionnaire (see

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[2] Statistical Package for the Social Sciences, a quantitative data analysis computer package.

appendix B) was used. However, with open-ended questions in a questionnaire on the use of computers, it is all too easy to end up with the list of software packages that a student uses. To avoid this the questions focused on why the students used computers in each stage (see section 2.1.1) and what they might have used them for had the facilities been available. Despite this a small number of respondents did just list software.

The questions were asked at the start and end of the core course for both Cranfield MBAs. The Open University MBA uses the three stage model during the summer school but does not make it explicit to the students. Because of the short time scale of a summer school it was felt that the Open University students would not be sufficiently aware of the model to use it as a framework for answering questions or have the time to answer another questionnaire.

Whilst it might have been considered most appropriate to survey the Cranfield students after the core programme, there was a danger there could be a normative effect, particularly within a stream, perhaps influenced by the work on the electronic cases. Moreover, response rates in the middle of the programme were unlikely to be as good as at the start.

The questionnaire was piloted with a group of students studying one of the electives in the previous year. One of the aims of the pilot was to determine whether students would object to putting their exam numbers on the questionnaire allowing their responses at the start and end of the core course to be matched. The pilot also showed that the types of computer support such as those given in figure 2.7 were not recognised.

The open-ended responses for each student from both questionnaires were collated into a single document identified by exam number. Within each document, NUD•IST[3] sections were used to identify responses to individual questions for each questionnaire. This allowed responses to be considered as a whole or to be sub-divided according to which question the student was answering in terms of stage of case study (individual, group, class) or in terms of why they were using computer support or what they would like to use or in terms of responses to the first or second questionnaire.

In addition, some of the quantitative data collected on each student was added to the NUD•IST project by generating command files to code each document. This allowed responses to be sub-divided according to student demographic characteristics.

The comments about computer usage were coded using an open-coding approach with one category scheme (see appendix C) for all questions using NUD•IST's indexing techniques to distinguish between responses about individual, group and class work. The distinction in the questionnaire between why computers were used and what might have been used was merely designed to elicit appropriate response as already discussed.

3.3.3 Computerised cases: resource-based

The third type of investigation sought to identify how the students actually behaved when using computers in collaborative learning and the effects on that learning. Observation of students on the Cranfield programmes using computers was difficult because many students use their computer at home and unobtrusive observation of study groups was not possible. To make the use of computers more explicit so that the

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[3] Non-numerical, Unstructured, Data - Indexing, Searching and Theorising, a qualitative data analysis computer package .

effects could be observed, a quasi experiment was undertaken with the full-time Cranfield MBA. This experiment also allowed the effects of providing resource-based computerised cases to be studied.

In the Cranfield core programme in 1995/96 there were no computerised cases. Cases were provided to students in paper form via a case-pack and students wanting to use a computer to analyse numerical data had first to type in the data. In cases with substantial amounts of information, the only approach available to the student was to read the whole document, no electronic searching was available to them.

As part of this experiment two cases were converted to machine readable form. Half the students were given disk copies of these two cases in addition to the standard paper case pack. The same content was provided as in the paper cases in a similar format (ie using only text and diagrams) and with the same look and feel as a paper case. Thus the main difference between the computer case and the paper-based cases would be the availability on the computer of searching and data manipulation facilities.

The effects of the computerised cases were assessed by a small number of study groups videoing themselves working on the cases, video and observation of the class discussion of the case and talking to students, lecturers and support staff. Commentaries on the study groups and on the class discussions were written using the videos and my observation notes (class discussions only). These commentaries were analysed by chronologically comparing the events in the streams where the computerised case was used with the other streams.

This investigation was only undertaken with the Cranfield full-time MBA. The Open University summer schools already used a computerised simulation case which was observed (see next investigation). For the Cranfield part-time MBA there were less interest from faculty in providing computerised cases in part because of the use of Lotus

Notes as a conferencing tool. In addition, the pre-existing use of the conferencing tool to provide supplementary information would have made the experiment less useful.

3.3.4 Computerised cases: simulation

As already indicated the Cranfield core programme does not include any computerised simulation cases. The investigation based around the simulation case used on the Open University summer school allowed the use of such cases to be studied.

The simulation is designed to show students how the various functional areas covered in B800 come together within a business and provides necessary motivation for the subsequent study of strategy. The computer software acts like an executive information system for the case and also allows students to set input variables used in the simulation. No computer facilities were provided for analysis or presentation.

Students were introduced to the case before and at the residential school and work in teams to play three rounds during the school. Following the school they could play a further three rounds using computer conferencing. During the school and as part of the next written assessment students reflected on their team performance.

I was the expert tutor for the computer simulation at two residential schools in 1996 and in this role acted as advisor to all students who were having problems either of a technical nature or concerning their understanding of the model. In practice this meant that my observation of the students tended to be limited to when they had problems. In addition to notes of these observations, there are conference messages following the school and the formal review by faculty of the simulation case. The conference messages refer to further problems experienced by the teams and comments on the simulation case of a review nature. Messages relating to decisions on the simulation case were exchanged via email or telephone and could not be captured.

The information collected was collated in order to identify perceptions of how the simulation case contributed to the students' learning. In contrast to the resource-based cases, the use of computers was central in the simulation case studied. In consequence, the students needed to make effective use of the computer support. The analysis identifies areas where this adversely affected the use of the case.

3.3.5 Computer conferencing

The final investigation concerned the use of conferencing by the part-time Cranfield MBA. The part-time core programme uses Lotus Notes to support the collaboration in stage 2 of the case method and also as a way of providing supplementary information and further discussion in stage 3 of a case. Although conferencing was available to the Open University students they did not use it for the simulation cases, for obvious reasons of competitive secrecy they preferred email. Other uses by Open University students of computer conferencing did not involve collaborative case based learning.

Two study groups volunteered in the second term to provide all their Lotus Notes messages. The structure of the conferences were analysed in terms of participation levels and thread lengths. The messages were extracted from Lotus Notes and reformatted for analysis in NUD•IST. Open-coding was used to categorise the messages from a content and purpose perspective. The same category system was used with the conferencing data from two cohort-wide conferences, one general and one course specific.

3.3.6 Research case study investigations

In two of the investigations (described in 3.3.1 and 3.3.2), students were asked about their attitude to computers and their opinions on the use of computers during each stage of studying a case. It was hoped that these investigations would establish students' attitudes to computers in general and thus their readiness to use the four types of

computer support identified in chapter 2. In interpreting the results, the exposure of students to the types of support in the different research case studies needs to be considered.

The other three investigations (described in 3.3.3, 3.3.4 and 3.3.5) were designed to investigate the students actual behaviour when using computers in the three stages of studying a case. In designing the investigations, consideration was given to the inclusion of the four types of computer support described in section 2.3. This is summarised in figure 3.3. Each of the behaviour investigations was designed so that data was collected about each stage where the computer support might reasonably be used by students based on figure 3.1.

Behaviour investigations	**Computer support**			
	Analytic tools	**CMC**	**Meeting support**	**Computerised cases**
Computerised cases: resource-based	✓		✓	✓
Computerised cases: simulation				✓
Computer conferencing		✓		

Figure 3.3 Computer support covered in each behaviour investigation

In addition to the investigations, documents were collected about each MBA regarding the programme and the intake. As part of the computer attitude survey the following demographic data was collected about the students: sex, first or preferred language, age. The computer attitude survey required the sex of the respondent for scoring and may have been language dependent. The students in the three research cases have quite different age profiles, so age was collected to as a way of exploring differences between the cases.

For the full-time Cranfield MBA students, MBTI type and core course examination results were collected. MBTI was collected because it is an indicator of learning and teaching styles (see section 2.2.1) and as a way of determining whether the respondents were typical of full-time Cranfield MBA students. Examination results were collected to see whether the computer attitude scores were correlated with exam performance in the same way that performance in accounting is a good predictor of overall exam performance.

3.4 CONCLUSION

This chapter has established that the research will seek to understand the computer support of collaborative case based learning by MBA students by undertaking a major research case study on the Cranfield full-time MBA core course and supplementary studies of the Cranfield part-time and Open University distance learning MBA core courses. In addition to collecting documentary and demographic data about each MBA, five investigations were conducted. As explained in section 3.3, the first two investigations sought to establish the students' attitudes to computers and the last three their behaviour when using computers. Figure 3.4 summarises the investigations that were carried out with each of the three research cases.

Investigation	Cranfield full-time	Cranfield part-time	Open Univ. distance learning
Computer attitude survey	✓	✓	✓
Computer support of case based learning	✓	✓	
Computerised cases: resource-based	✓		
Computerised cases: simulation			✓
Computer conferencing		✓	

Figure 3.4 Investigations carried out for each research case study

The next three chapters discuss each research case study, describing the conduct and findings from each investigation and present an evaluation of computer support of collaborative case based learning in each MBA.

4 Full-time programme

This chapter describes the most extensive of the three research case studies, the study of the 1995/96 cohort on the full-time MBA at Cranfield University School of Management. This MBA is one of the most established and well-respected MBAs in the UK and is already well-supported by computers. The next section describes the structure of the programme, the profile of the students and the learning experience.

Access to the MBA was facilitated by the author's long-standing relationship with the School as a student and lecturer (see chapter 1). While access to the students and their results was good, and lecturers and course officials were very helpful and supportive, investigations were limited to those which could be demonstrated to have no detrimental effect on student performance.

Section 4.2 describes the way in which the investigations, discussed in chapter 3, were undertaken and the following sections present the results for each investigation. For this research case study the investigations were the computer attitude survey, the study of computer support of case based learning and observation of the use of resource-based computerised cases.

Findings and conclusions from this study are presented in section 4.6. The effectiveness of the study is assessed and findings summarised from two perspectives: the attitudes of the students to computers and their behaviour when using computers. The chapter concludes by highlighting issues and contradictions in these findings.

4.1 PROGRAMME

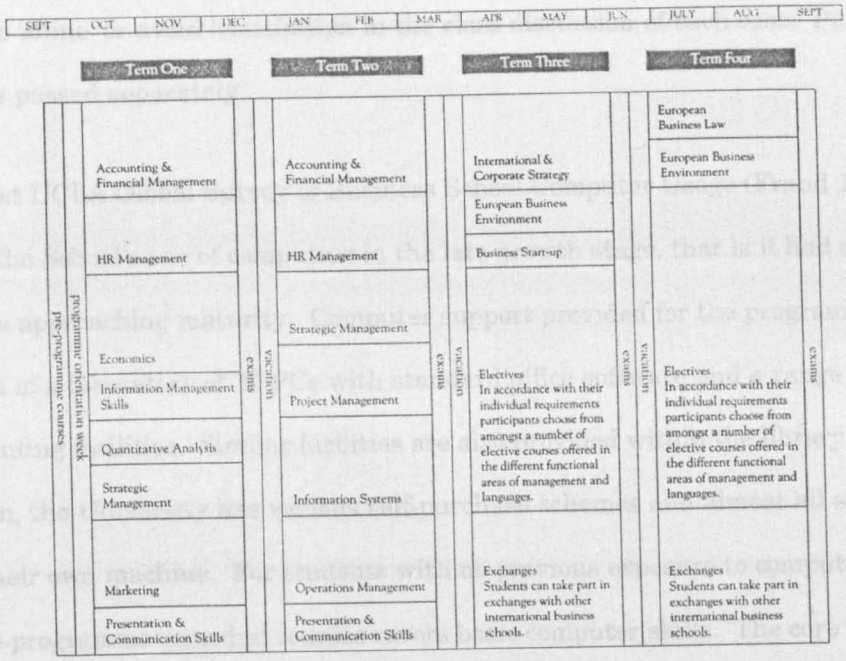
The full-time MBA programme at Cranfield University School of Management is one of the oldest and largest in the UK. Its origins can be traced back to the Work Study Unit set up in the College of Aeronautics at the end of the second World War. The first MBAs graduated when the University received its charter (as the Cranfield Institute of Technology) in 1969.

The programme is in a market that having undergone a period of considerable growth is no longer growing (Slack 1995). Within the market the Cranfield full-time MBA programme is relatively large (Slack 1995). This places the programme in the lower left quadrant of the Boston Box generating cash to support other activities (often referred to as a 'Cash Cow') rather than being the recipient of development funding.

The main objective of the programme is 'to develop in the student an ability to assess and analyse evidence and then make and implement appropriate decisions' (Cranfield 1994a p4). The collaborative case-study is the dominant strategy for the programme (see section 2.2) which stresses the importance of a 'cooperative approach to problem solving' (Cranfield 1994a p4). The programme lasts for twelve full months divided into four terms with only three two-week vacations between the terms. Study is intensive and 'requires great stamina and commitment' (Cranfield 1994a p1) on the part of the students. Most students live on or close to campus in many cases bringing their families with them.

Programme Outline

The MBA year



a typical *day*

8.30 Financial Management
Discussion of a case on capital budgeting

9.40 Industrial Relations
Case study discussion on productivity bargaining

11.00 Business Economics
Lecture and discussions on monetary policy and inflation

12.10 Marketing Lecture
on developing marketing plans

14.00 Study Group meeting to prepare for subsequent class
a case study discussion on Operations Management

17.30 Private study. Working through statistics exercises, preparing case study for group discussion the following day and reading a chapter on monetarism.

22.30

Two streams follow this pattern with formal classes in the morning and study groups and private study in the afternoon. The remaining streams have study groups and private study in the morning followed by formal classes beginning at 13.30 and finishing at 18.10.

This cycle is reversed on a weekly basis.

Figure 4.1 Cranfield full-time MBA year (Cranfield 1994a p3)

Part 1 of the programme is the core course which lasts for two terms. Part 2 consists of a mixture of elective courses, compulsory courses and, for some students, exchanges with other overseas business schools (figure 4.1). Assessment is by examination in the eleventh week of each term, class tests, written assessment of case exercises and various other elective specific methods. However, the major motivator in class is the desire to 'shine' or avoid humiliation in the class discussion of each case. Parts 1 and 2 must be passed separately.

The First UCLA Global Survey of Business School Computer Usage (Frand 1992) placed the School's use of computers in the late growth stage, that is it had developed and was approaching maturity. Computer support provided for the programme consists of a laboratory of 30 PCs with standard office software and a range of scanning and printing facilities. Similar facilities are also provided within the library. In addition, the University has various self-purchase schemes and almost all students have their own machine. For students with no previous exposure to computers, one of the pre-programme remedial courses covers basic computer skills. The core programme includes a non-assessed course on 'Information Management Skills' covering word-processing, spreadsheets, presentation software and information retrieval from online sources. The course supports the students in 'research and analysis and for preparation of reports and presentations.' (Cranfield 1994a p10)

In 1995/96 the entry requirements for the full-time MBA programme were a first degree, at least three years business experience, a GMAT[1] score of at least 620 and satisfactory references and interview. The age profile and backgrounds of the students are shown in figures 4.2 and 4.3. The students are recruited from all industrial sectors

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[1] General Management Aptitude Test - a US based measure of aptitude for graduate management courses widely used as an admissions criterion in the UK.

with a strong emphasis on manufacturing and engineering. As a condition of entry, students must have three years managerial experience and come from both general and specialist management positions. Very few (3%) are IS/IT specialists. The average student (age 31) would have been 17 when the IBM PC was first sold. Typically the programme recruits a small percentage of women students (21 out of 149 enrolled on the 1995/96 programme), and a significant number of international (21% in 1994/95) and other European (11% in 1994/95) students.

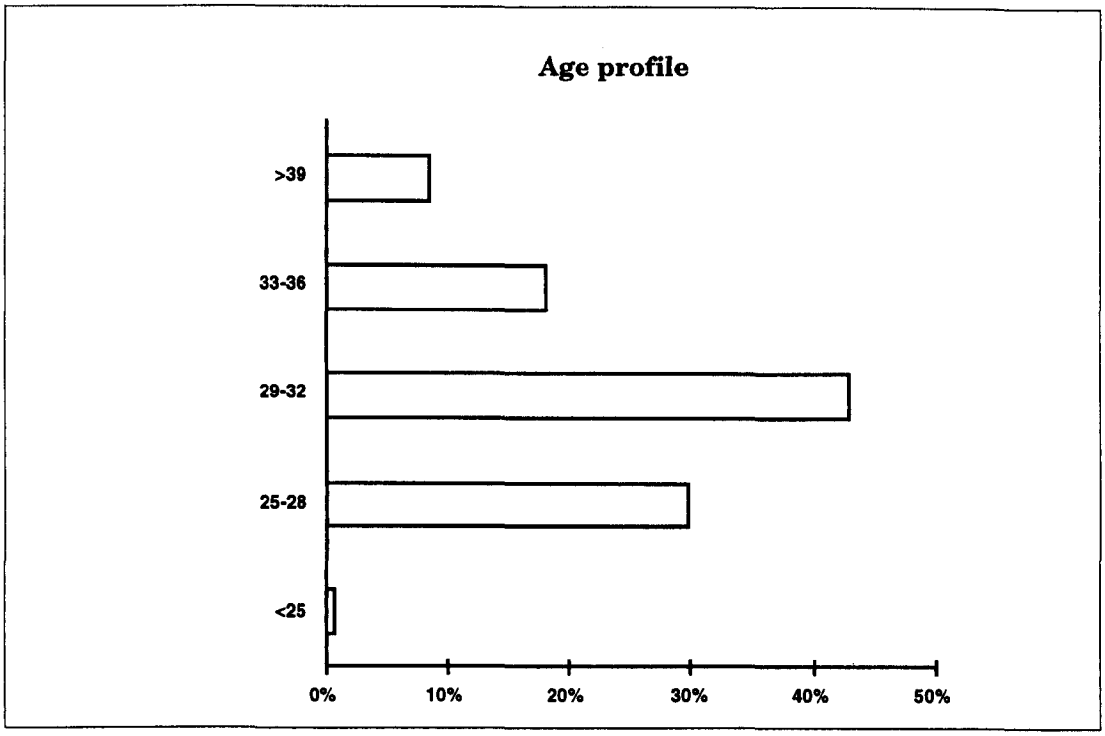

Figure 4.2 Age profile of students on entry to 1995/96 full-time MBA, n=149

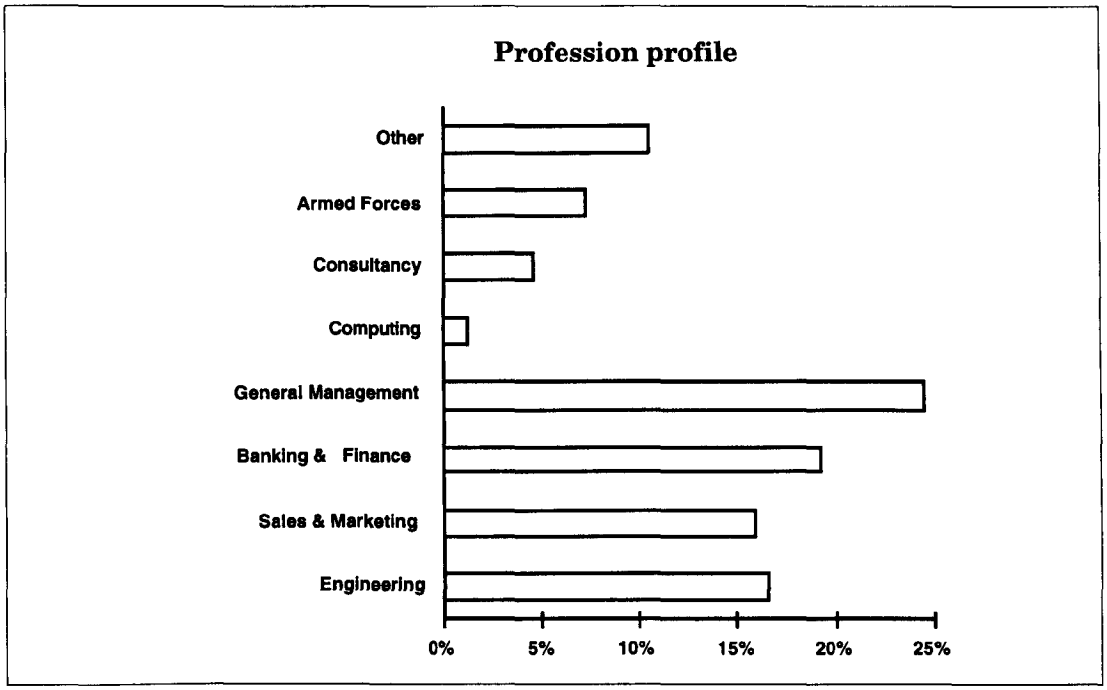

Figure 4.3 Profession profile of students on entry to 1995/96 full-time MBA, n=149

During the programme students are scored on the Myers-Briggs Type Indicator (see section 2.2.1). The MBTI profile of the 1990/91 cohort (latest available figures) is shown in figure 4.4. This shows the dominance (89%) of the thinking (T) type which fits with the anecdotal stereotype MBA student, however the only slight preponderance of Extraversion (E) (58%) over Introversion (I) (42%) types does not. The relative bias in the Cranfield intake towards students with an engineering background may explain this. This type of students 'tend to base [their] decisions on logic and objective analysis of cause and effect' and 'prefer to focus on the outer world of people and things' rather than 'the inner world of ideas and impressions' (Norris 1991).

ISTJ 9%	ISFJ 1%	INFJ 1%	INTJ 14%
ISTP 4%	ISFP 0%	INFP 2%	INTP 11%
ESTP 5%	ESFP 1%	ENFP 5%	ENTP 17%
ESTJ 13%	ESFJ 0%	ENFJ 1%	ENTJ 16%

Figure 4.4 MBTI profile of students in 1990/91 full-time MBA, n=166

The investigation focused upon the core course which is typical of the compulsory material covered in most UK MBA programmes of this type. The core course on the MBA programme is taken by students studying for the degrees of MBA, MSc in Project Management and DEng[2]. The MSc is in effect the MBA programme but with predetermined 'electives'. The DEng students take the core course as part of the taught element of their four year programme. In 1995/96 of 175 students on the core course, 149 were on the MBA programme, 10 on MSc in Project Management, and 16 on DEng.

The students are divided into four streams (red, blue, yellow and green) for the core course. Each stream is taught separately but as far as possible the student experience is the same. Frequently lecturers teach two streams and generally assessments are the same or similar across streams. Courses are taught in parallel throughout the term as illustrated on the timetable for term 2 shown in figure 4.5.

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[2] Four year doctoral programme aiming to equip graduates for positions in industry.

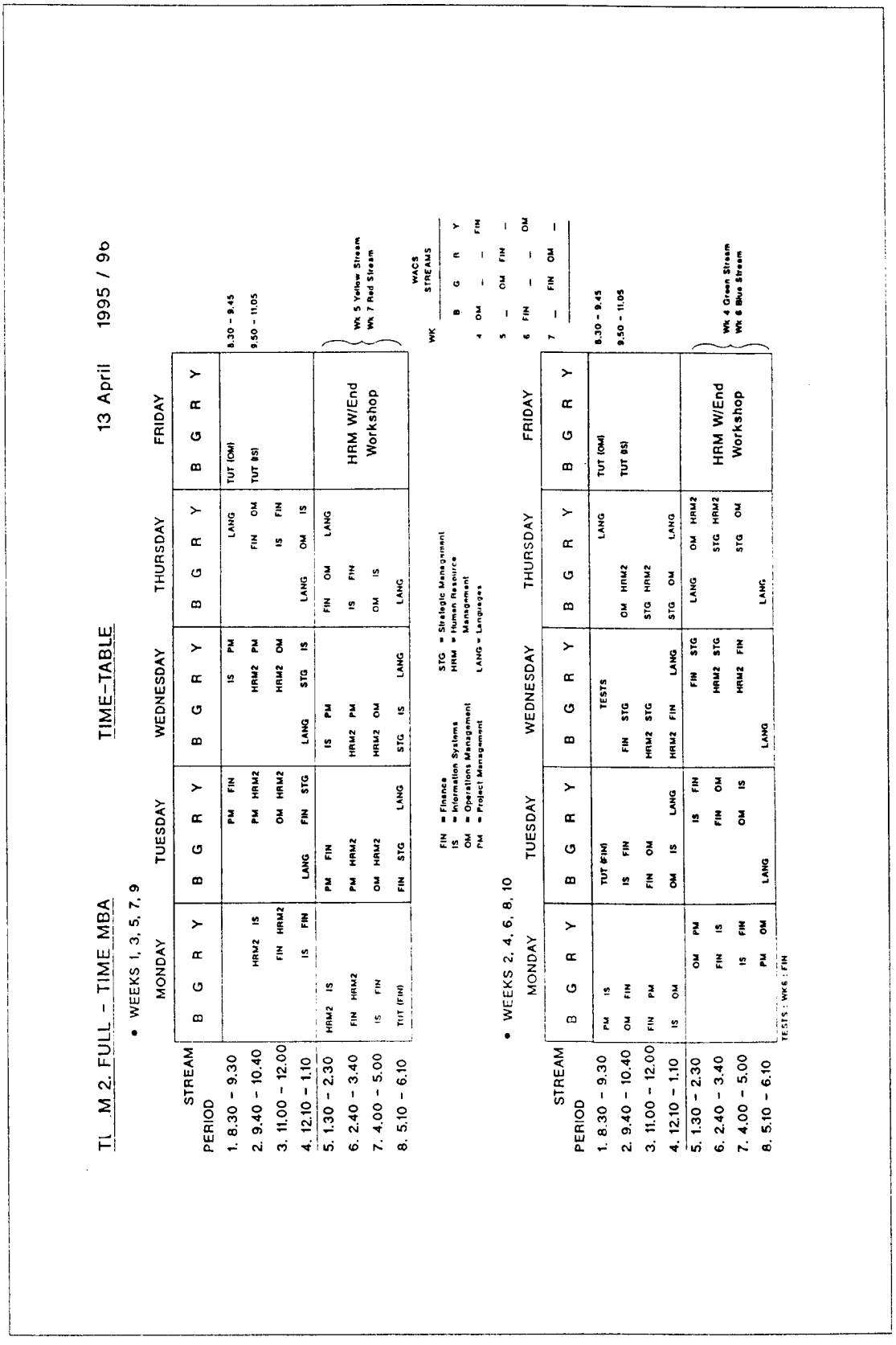

Figure 4.5 Timetable for term 2 of core course on full-time MBA

The method of teaching on the core course and to a lesser extent on the electives is the collaborative case method as described in Sweeney and Oram (1992) and elaborated in chapter 2. Cases are normally subject specific and each lecture period shown on the timetable involves the discussion of at least one case, so students typically study fifteen cases per week during the core course. A case normally consists of between one and twenty pages including tables of supporting data and a series of questions. Study of each case follows the three stage model summarised in figure 2.1; individual students read and analyse each case before meeting to discuss it with their study group shortly before the lecture discussion. Students work in the same study group of six students throughout the term. Students are randomly assigned to study groups subject to those with an accounting background being evenly spread.

4.2 INVESTIGATIONS

Three investigations were undertaken for this research case study. The attitude of the students to computers was investigated using the computer attitude survey (3.3.1) and the computer support of case based learning qualitative questionnaire (3.3.2). Demographic data was collected about students to ascertain whether survey samples were representative of the population. The behaviour of students whilst using computers during the study of cases was investigated by using a quasi experiment involving two computerised resource-based cases (3.3.3). A finance and an operations management case were converted to computerised form for this purpose.

The investigations were constrained by the need not to interfere with or interrupt the students' learning and the need to be seen not to interfere or interrupt. This requirement was expressed both by the Director of the Full-time MBA Programme and by the Chairman of the Graduate Programmes Committee, the Deputy Director of the School. This attitude to the research of a former colleague was in line with the

frequently expressed concern in the Graduate Programmes Committee (89-92) to limit the grounds for student appeals against failure.

Data was collected from the 1995/96 cohort at a number of points throughout and immediately after the core course as shown in figure 4.6. The data collected for each investigation is shown in figure 4.7.

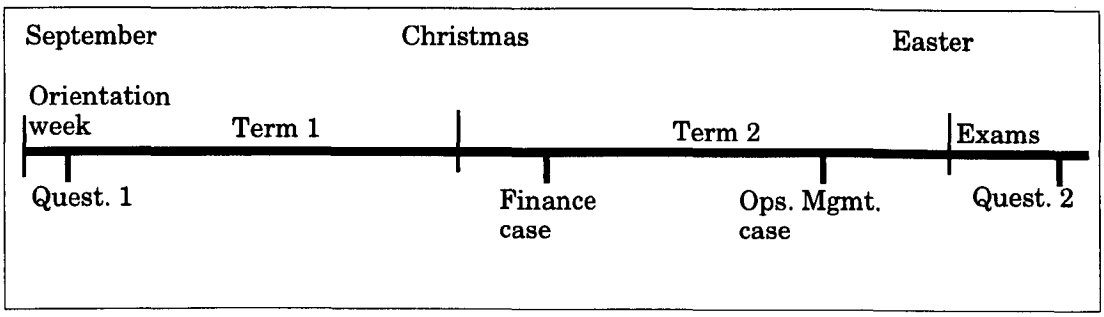

Figure 4.6 Data collection during the core course

	Data collection				
Investigation	**Quest. 1**	**Self-video**	**Class video**	**Quest. 2**	**Exam**
Computer attitude survey	✓				
Computer support of case based learning	✓			✓	
Computerised cases: resource-based		✓	✓		
Demographics	✓			✓	✓

Figure 4.7 Data collected for each investigation

Questionnaire 1 was administered during the first 'orientation' week of the MBA after the students had worked on their first case. The research was introduced and the questionnaire distributed during a fifteen minute session; the questionnaire was

collected anonymously later in the week. Subsequently, two reminders were sent to all students to reduce non-respondent bias.

Questionnaire 2 was administered just before the start of part 2 via student pigeon holes. Subsequently, students were prompted to return their questionnaire via a letter.

Overall the response rates to the questionnaires were good with 123 of the total population of 175 (70%) returning the first questionnaire and 63 (35%) the second . The response rate for the second questionnaire was reduced not only because the students were much busier but some students may not have received the questionnaire (the DEng students and those on exchange programmes, about 40 students) despite the researcher's best efforts.

Exam numbers allowed the responses from the two questionnaires to be correlated for 38 students. (The exam number was not given or was duplicated for 9 responses to questionnaire 1 and 11 responses to questionnaire 2.)

Of students responding to the first questionnaire 14 were female and the average age was 31.2 with ages distributed as shown in figure 4.8. These figures are in line with those for the whole population. There was no significant difference between the exam results of those responding and the whole population. The MBTI profile for students responding to questionnaire 2 (figure 4.9) were similar to previous year MBTI distributions (within the limitations imposed by the small numbers there was no statistically significant difference).

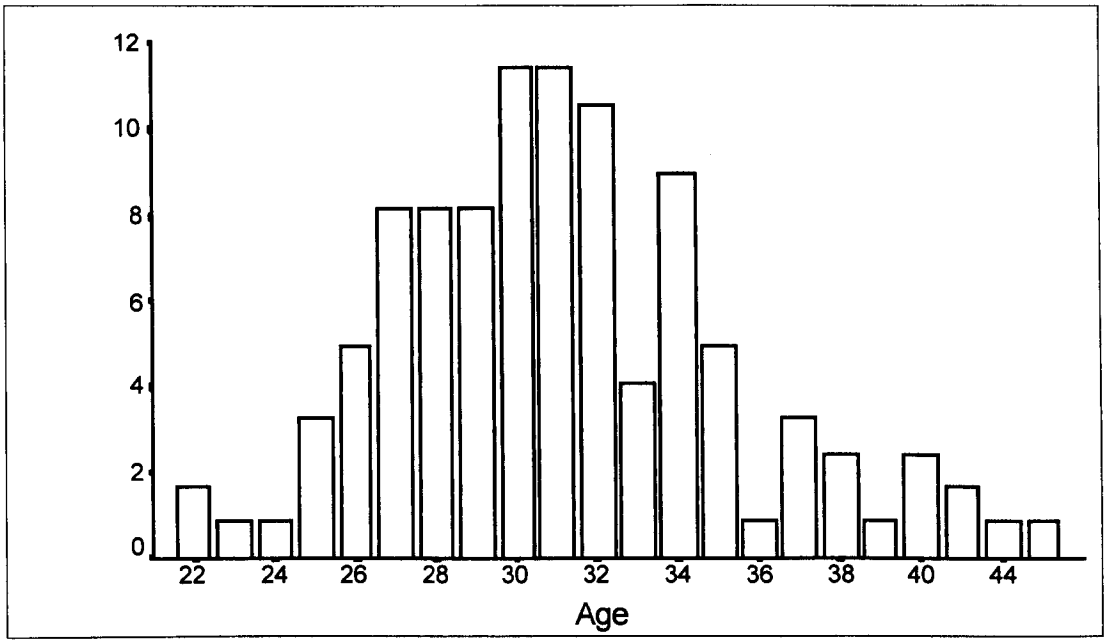

Figure 4.8 Age distribution of respondents, n=123

ISTJ 14%	ISFJ 2%	INFJ 0%	INTJ 10%
ISTP 2%	ISFP 0%	INFP 2%	INTP 10%
ESTP 3%	ESFP 0%	ENFP 2%	ENTP 16%
ESTJ 14%	ESFJ 2%	ENFJ 5%	ENTJ 21%

Figure 4.9 MBTI profile of respondents, n=63

The next three sections describe the conduct and findings of each of the three investigations: computer attitude survey, computer support of case based learning qualitative questionnaire and the use of computerised resource-based cases.

4.3 COMPUTER ATTITUDE SURVEY

The computer attitude survey sought to provide a context for the remaining investigations. In particular the survey establishes the shape of the distribution of attitudes to computers at the start of the programme. A survey developed by Robertson (1995a) was administered as part of questionnaire 1. The internal reliability was verified for this population with an alpha coefficient of 0.91. The averages and variances for the sub-scales (see figure 3.2 for a description of the sub-scales) and overall scale on a range of 1 (low) to 5 (high) are shown in figures 4.10 and 4.11.

Sub-scale	**Mean**	**Variance**
Anxiety	3.86	0.50
Confidence	3.87	0.17
Cognitive	3.65	0.10
Behaviour	3.79	0.20
Liking	3.98	0.48
Use	3.41	0.29
Competence	3.94	0.46
Computer Attitude Scale	**3.78**	**0.15**

Figure 4.10 Results of attitude survey (123 respondents, 14 female)

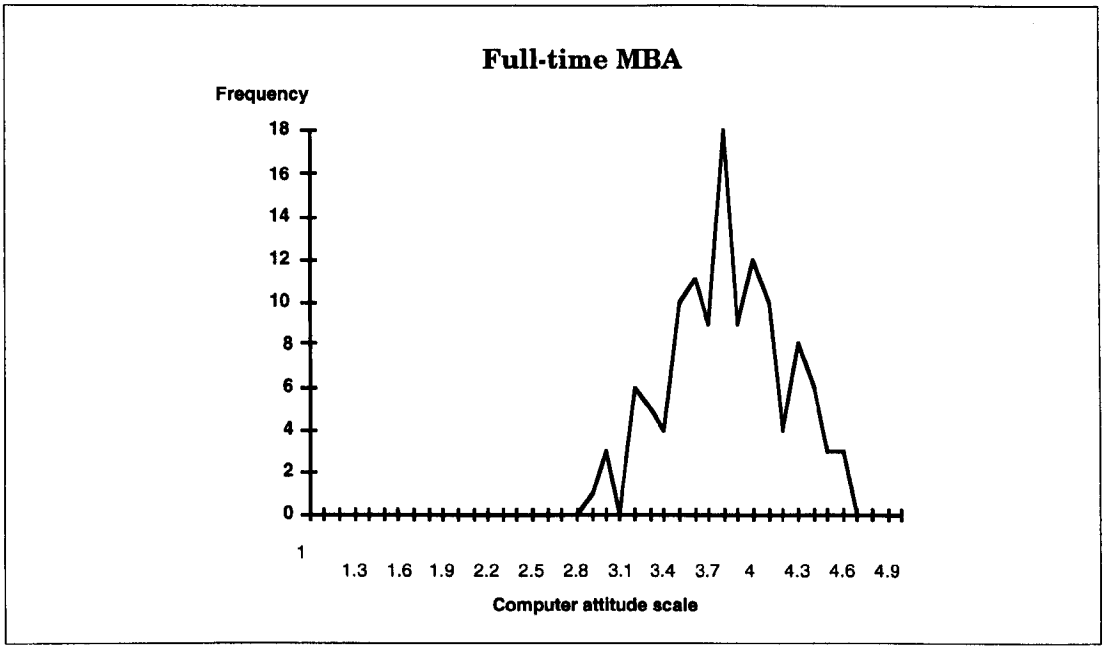

Figure 4.11 Distribution of computer attitude scale, n=123

The figures show values for all respondents. The difference in attitudes between men and the small number of women was investigated but no significant difference in means were found though the Cognitive sub-scale did show a significant difference between the variances (F test: p=0.043).

The computer attitude scale and part 1 exam results were examined for statistical correlation. No correlation was found between the computer attitude scale and either the composite exam result or the individual results for the subjects of Accounting or Information Systems (these subjects being where evidence of the effect of numeracy or exposure to computers might be expected).

In interpreting these results, the notable feature is the uniformly high averages across the sub-scales and relatively low variances. It is interesting to compare these results with those obtained by Robertson et al (1995b) in their study (see figure 4.12). The Open University students in their study were technical post-graduate students studying a management option and since they were attuned to working with computers

it is not surprising that their computer attitude scale is the highest. The management students in this study had an higher overall attitude scale than the secondary students and parents and on each sub-scale except use.

Sub-scale	**Mean**			
	OU students	**This study**	**Secondary teachers**	**Parents**
Anxiety	4.16	3.86	3.64	3.60
Confidence	4.25	3.87	3.80	3.49
Cognitive	3.83	3.65	3.62	3.48
Behaviour	4.02	3.79	3.23	3.63
Liking	4.22	3.98	3.56	3.40
Use	4.02	3.41	3.56	3.84
Competence	4.17	3.94	3.71	3.28
Computer Attitude Scale	**4.07**	**3.78**	**3.63**	**3.51**
Number of respondents	60	123	65	28

Figure 4.12 Comparison with results from pocket book study (Robertson et al 1995b)

The attitude survey indicates that the MBA students were generally positive about computers. From the sub-scales it appears that the students were not particularly anxious about computers, were confident about their use of computers and regarded themselves as competent computer users. These results are supported by a low participation in the pre-programme basic computing skills course (7%) and similarly low participation in the term one non-assessed Information Management Skills course.

The narrow band of scales recorded and the shape of the distribution indicate that in the other investigations of the full-time MBA programme there is no need to consider subsets of the population by computer attitude scale.

4.4 COMPUTER SUPPORT OF CASE BASED LEARNING

This study set out to establish the student's views on how computers can support case-based learning. Questions (Appendix B) for an open-ended questionnaire were developed based on the three stage model of case analysis (figure 2.1) which is extensively used at Cranfield.

As already described the questions were distributed to all the students on the full-time MBA during orientation week as part of questionnaire 1 (see section 4.2). At this stage the students had only just arrived and had little experience of case based learning. Students were encouraged via their stream representative to return the questionnaire but some were delayed into the first few weeks of term when their experience was much greater.

The questions were repeated as part of questionnaire 2 at the end of the core programme, by which time students would have worked on over 300 cases and would have had the opportunity to attend the Information Management Skills course. In the first questionnaire, students were asked how much they expected to use some form of computer support in each of the three stages and in the second questionnaire, how much they had used computer support. Analysing the results for those who answered both questionnaires shows that students used computer support rather more than expected even in class work (figure 4.13).

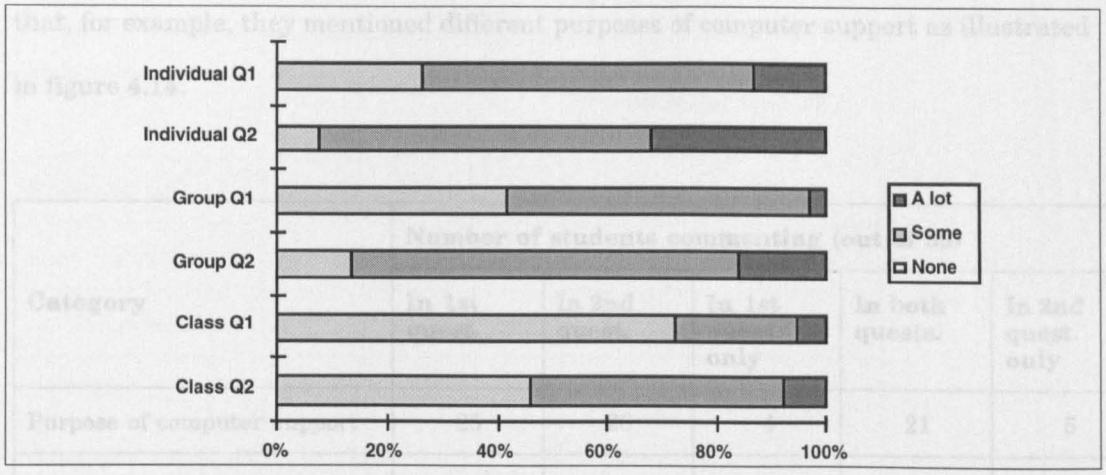

Figure 4.13 Use of computers during individual, group and class work on case studies, n=38

The main element of the survey was the open-ended questions where students were asked why they used computer support in each stage and what additional support they would like to use if it were available. Of the 148 students who replied to either or both questionnaires, 125 made some sort of response to the open-ended questions. This included some who used no computer support.

From the open coding of the responses using NUD•IST (see 3.3.2 and appendix C) three main categories of comment emerged:

respondents (118 of 125) commenting on their purpose in using the computers to support case study work,

respondents (66 of 125) commenting about their desires for computer support or complaining about the absence of facilities,

and a small collection of uncoded comments that didn't fit into either category.

Responses made by students who answered both questionnaires were considered. Not surprisingly, they were more verbose in the first questionnaire. Interestingly, they frequently discussed different but not contradictory things in the two questionnaires so

that, for example, they mentioned different purposes of computer support as illustrated in figure 4.14.

Category	Number of students commenting (out of 38)				
	In 1st quest.	In 2nd quest.	In 1st quest. only	In both quests.	In 2nd quest. only
Purpose of computer support	25	26	4	21	5
Presentation	14	19	3	11	8
Data manipulation	13	16	7	6	10
Computer-aided learning	4	3	4	0	3
Process improvement	9	10	6	3	7

Figure 4.14 Different purposes of computer support identified by respondents to both questionnaires

Responses were to be sub-divided according to student demographic characteristics. However the small number of women and the large number of unknown MBTI scores (because this was only known at the time of the second questionnaire) meant that it was only appropriate to consider an age breakdown (ages were banded in three year intervals).

The next three sub-sections discuss in detail the three main categories of comment.

4.4.1 Purpose of computer support

At the first analysis, nine different types of comments emerged concerned with the purpose of support, these were grouped into four main sub-categories as shown below in figure 4.15. The numbers show the students commenting on each type of support so that the same student may be included in the count for several sub-categories. The following sub-sections discuss each of these four sub-categories.

Sub-category	Number of students commenting (out of 125)
Presentation	81
Data manipulation	75
Numerical data	64
Notes	21
Computer-aided learning	25
Computer-based learning	12
Interactive learning	10
What-ifs	6
Process improvement	54
Speed/accuracy	29
Sharing information	28
Understanding	10

Figure 4.15 Frequency of comments made about purpose of computer support

- **Presentation**

  Two aspects of the computer support of presentations were described by respondents. The first aspect was the production of professional documents or presentations which were legible and included graphs or drawings. The use of computers also assisted production by allowing the work of individuals to be combined and more easily to refined. Moreover, something tangible was produced which could easily be copied and distributed to the group.

  'Used in preparation of presentations, gives professional looking reports which are easy to modify and correct with repeatable formatting style' f96273

'To produce a high quality, tangible document, to manipulate data, high quality graphics and visual presentations' f96175

'To compile everybody's work and put them into the same format' f96207

'Easy to distribute to other group members, edit on screen / permanent record, use of things like powerpoint for presentations' f96128

The other aspect was the actual process of oral presentation supported either by online projection facilities or through computer-produced visual aids. Views seemed to be polarised over the desirability of using computer projection.

'Computer used during presentations either physically used to display slides or to produce OHP slides - neater and more professional looking presentations.' f96273

'Lecture rooms for presentations without Powerpoint or computer link projection facilities are frustrating so projection equipment which picks up lap-top and uses OHP is essential' f96241

'Desktop / laptop in classroom connected up permanently for presentations' f96172

I think overheads are a better presentation technique than computers in class' f96197

'Lecturers who can use projector instead of OHP.' f96111

While presentation was most often mentioned in the context of the class work on cases (72% of those who commented on presentation), it was also seen as important in group work (57%) and to a lesser extent in individual work (36%). There was a slight increase (from 62% to 73%) in the number of comments made on presentation between the beginning and end of the core course. In considering the characteristics of the population, age made little difference to the number of comments about presentation.

- **Data manipulation**

The point most commonly made by respondents was that manipulating data is more convenient and quicker using a word processor or spreadsheet. Some comments also referred to the use of computers for rather more sophisticated analysis than note taking or simple calculating.

'Convenience, presentation, required to hand typed work in, storage, ease of working, manipulation words and data.' f96128

'Can change details quickly / amending is easy.' f96208

'Cuts out a stage - rough notes - typed notes.' f96172

'To collate, analyse and display data.' f96213

'For numerical calculation other than + - x divide.' x00007

'For statistical analysis in an Operations Management case.' f96167

'Finance spread sheet - ease of data change / manipulation; diagrams - clarity and presentation quality.' f96184

As might be expected data manipulation was most often mentioned for individual work (87%). It was also important for group work (56%) but not for class work (15%). As with the presentation comments there was a slight increase in comments between the beginning and end of the core course. There were noticeably fewer comments about data manipulation made by the older students (36 years and over).

- **Computer-aided learning**

Although terminology was a bit muddled at times, comments covered the spectrum from both computer-based learning through what-if analysis to interactive learning.

'Exercises and tutorials to work through as an aid to learning about a new subject.' f96113

'Support text book based learning - because its the future!' f96197

'Helps in group discussion - on the spot changes / sensitivity analyses etc.' f96185

'Research and trial and error on what if situations.' f96250

'The interactive method suits my learning process. Interactive analysis tools. Business games.' f96145

'Number crunching exercises or programmed 'game' type cases where decisions are fed in and a result kicked out. Tutorials (interactive).' f96171

Computer-aided learning followed the same pattern as data manipulation in that most comments were about individual work (76%), rather less about group work (36%) and less for class work (20%). Compared with presentation and data manipulation, there was a rather more marked increase in comments between the beginning and end of the core course.

Generally speaking computer-aided learning was more relevant to the older students (33 years and older) than the younger group although with the lower overall numbers responding with comments about computer-aided learning, this can only be regarded as an indication.

- **Process improvement**

This final categorisation of comments was about how computers helped to improve the process of studying cases. Respondents commented on how computers made tasks faster, easier and more accurate as well as making it easier to understand concepts and amend results.

'Ease of amending narrative (full rewrites) - ease of amending calculations (spreadsheet) - speed / flexibility.' f96163

'For writing up report - so many changes before the actual submission; for analysis - avoids recalculation every time the inputs are changed.' f96196

'Used for spread sheet analysis and preparation of overheads for group presentations. Did so because saved a lot of time and ensured we were all thinking on same lines.' f96215

'Facilitate group discussion and understanding of mundane numerical "number crunching".' f96155

The advantages of computers for the sharing of information perhaps through the use of email were noted although not everyone saw computers as a positive aid to group working.

'Pooling of analysis - notes, spreadsheets.' f96119

'Email, to transmit notes amount learning group colleagues, to speed up team working.' f96114

'Results of meetings posted on Lotus Notes for other groups to read. On group assignments, it is easier to make corrections to presentations and spreadsheets in real time.' f96122

'The computer studio stuff - DPM etc - never quite attract me as I don't use the studio for other work since I have my own PC - so need items / info on a disk for individual work. Not appropriate [for group work] - PC's are difficult to share.' f96115b

Computers were seen to improve the process of both individual and group work equally (69%) and to have a much smaller impact on class work (15%). There was no real difference between responses at the beginning and end of the core course. There was no discernible trend in the number of comments about process improvement made by different age groups.

4.4.2 Desires for computer support

Four main sub-categories emerged concerned with the student's desires for computer support from the analysis as shown below in figure 4.16. They are discussed in more detail in the following sub-sections.

Sub-Category	Number of students commenting (out of 125)
Enhanced equipment	35
Network	26
Disc based information	16
Unhappy with technology provision	23

Figure 4.16 Frequency of comments made about desires

- **Enhanced equipment**

  The comments about enhanced equipment covered desires for the computer laboratory, study group areas and classrooms.

  'Better, faster PCs' f96106b

  'Scanner for OCR input of diagrams etc' f96109

  'Faster and more reliable computers and network in the computer studio.' y00001

  'One PC in each study group room(s)' f96197

  'Most class work revolved around presentations if there was a PC in each lecture room with a suitable mechanism for putting a Powerpoint presentation on a screen then that would be great' f96239

  Enhanced equipment was mentioned equally (57% of those who commented on desires) in the context of individual and class work but to a greater extent in

group work (71%). There was a noticeable decrease in the number of comments between the beginning and end of the core course.

There was a decline in comments as age increased but the small number of respondents outside the central age bands makes this an unreliable observation.

- **Network services**

This category of comments was about how respondents desired access from wherever they were to the University network and beyond.

'Network terminals in pig pens [study group work areas]' f96111

'Access to SoM [School of Management] network from rooms in halls of residence.' f96122

'Network lines in each room in the Halls + proper computer furniture - ELECTRONIC AGE!' f96193

'Remote access E-Mail - send messages to team members, transfer of files etc' f96132

'Modems in rooms on campus. What's the point of Lotus Notes without it?' f96198

'Networked research / library material with 'from home' access. I live in MK and could not travel in to Cranfield just to access a few articles. I would have done so from home.' f96214

Network services were mentioned in the context of individual (65%), group (73%) and, though to a lesser extent, class (38%) work. There was a decrease (from 43% to 31%) in the number of comments made on networks between the beginning and end of the core course. Age made no apparent difference to the number of comments.

- **Electronic information**

The desire for data in electronic form is represented in this category.

'Instead of buying books - having access to them on a CD ROM' f96148

'All case / WAC [Written Assessment Case] data to be provided in electronic format to save time loading / typing data into spreadsheet.' f96253

As might be expected individual work (75%) was the dominant category with group (19%) and class (31%) work much lower. Age made no apparent difference to the number of comments. Having been exposed to the provision of cases and other material on disc, it is not surprising that more comments were made about this in the 2nd questionnaire (33% as compared with 8%).

- **Unhappy with technology provision**

This category represents those comments that suggest a desire for less or different computer technology. Comments were polarised between those who thought computer use in some instances was inappropriate possibly because of their inexperience and those who felt the provision of technology at Cranfield was inadequate.

There were a number of respondents who felt that the electronic cases were unhelpful. There were also some comments about the difficulty of several people working with one computer and about the distraction of using a computer whilst in class. Finally the point was made that involving a computer can be 'just using technology for the sake of it'.

'Computer based cases were worse than useless. Needed to print them out before reading / working on them.' f96149

'Easier to calculate and set out figures; however computer based cases really only save on SoM's [School of Management] photocopying costs and increase my printing costs! (transfer pricing?!). [Group work:] Not really useful - you can't gather 6 people around 1 screen.' f96183

'It tends to be difficult to use the computer as a group - it is easier to discuss things and then work on the computer individually. I expect this depends on the course, but I cannot envisage how one might use the computer in lectures / classes, except using a notebook for making notes which I would find distracting' f96253

'I prefer to listen and become entirely involved in the classes, computers can detract from this' f96147

'Computer disk cases issued. Inevitably ended up printing out data. Lotus Notes - using technology for the sake of it i.e. going up to computer room and posting minutes of meetings. It is easier to discuss matters arising with other groups "en passant".' f96122

The comments about inadequacy of the computer provision were generally about there being insufficient equipment of the right type in the right place.

'Cranfield is years behind when it comes to computer generated presentations. Every lecture theatre should be equipped so that the presenter only needs to load the presentation on a floppy disk.' f96167

'Absolutely necessary for calculations, reports, presentations - computer studio facilities inadequate.' f96185

Respondents were least happy with provision in the context of the class (79%), less so for individual work (54%) or for group work (48%). More respondents over thirty were unhappy about technology provision.

With the exception of a small number of respondents (4) who were inexperienced with technology (by their own admission), the comments in this category were made in the 2nd questionnaire.

4.4.3 Uncoded views

Some of the comments made in response to the questionnaire did not code to the categories discussed previously but were of interest when matched to the student's computer attitude score.

As one might expect the student who said

> *'At the moment I am unable to use a computer and do not know what additional computer support there is, or isn't!' f96112*

rated themselves low (2.0) for competence but none the less rated 3.18 overall.

Similarly the student who commented

> *'I am not very computer literate so it is a difficult question.' f96154*

rated themselves 3.0 for competence and 4.2 for liking.

Some students used the questionnaire to reflect on the computer support:

> *'I don't own a computer but did feel the computer studio allowed me to collect my thoughts, and some time for class presentations.*
>
> *As the only student on the course without a computer, I found the Computer Studio quite adequate. A machine was always available. However, using the '486' machines were pretty slow with all the heavy duty software used.' f96197*
>
> Here the student had a computer attitude score of 3.73 with liking of 4.2 and anxiety of 4.0.
>
> *'A short course for people switching software would have been very useful at the outset of the year - ie. week 1, 2 - 4 sessions half day each Saturday & Sunday.' f96214*

This student had virtually no anxiety about computers (4.8) considered themselves to be very competent (4.4) and had an overall computer attitude score of 4.33.

4.4.4 Summary

This investigation considered how the students perceived their use of computers to support case based learning. The large number of responses (125 out of 148 returning the questionnaires) means that some quantitative as well as qualitative results can be derived.

By the end of the core course computers were being used extensively with only 8% of students saying that they did not use computers for individual work. From the open-coding it emerged that a substantial number of students used the computers at some point in their study of a case for presentation (65%), for data manipulation (60%) and/or various forms of computer-aided learning (20%). Almost half the students (43%) commented that the use of the computer improved their study process by increased speed or access, the ability to share information or improving their understanding.

The use of computers was such that a significant number of students (35) expressed a desire for more or better equipment with an enhancement in network provision sought by 26 students. Sixteen students would have liked to have received more or all information in an electronic form. Overall, 23 students were unhappy with the technology provided. In some cases this was because they saw the use of technology as being inappropriate or inefficient (possibly through inexperience). Some were unhappy because they felt the provision was inadequate.

4.5 RESOURCE-BASED COMPUTERISED CASES

The computer support of case based learning questionnaire described in the previous section examined the students' perceptions of their use of computers. A quasi experiment was set up to observe the students' actual use of computers and the effect on the learning process (see 3.3.3). In 1995/96 all cases in the core programme were provided to students in paper form via a case-pack. It is argued that providing some cases in a computer readable form to some streams would make it possible to observe the effects of the increased use of computers.

Teaching cases which exploit the full potential of multimedia (Alexander et al 1994, Taylor et al 1995) and include video clips, pictures and sound, provide much richer scenarios than is possible with a paper-based case. However, the cost of providing such full-function multimedia both in terms of the production of the cases and in the hardware delivery platform limits their practical usefulness for case based MBA programmes. Moreover, little attention seems to have been paid to the students' perception of what adds greatest value. Students on the Cranfield MBA programme regarded the minimal step of machine readability as the only significant factor (Younger 1995).

As part of this experiment a minimalist approach to the production of a multimedia business case was developed with an upgrade path so that if the cases proved popular more material could be added using other media (audio, visual, animation) (Oram 1996c). The next section discusses the development of the two minimalist multimedia cases used in the experiment.

For each case, two streams (half the students) were given disk copies of these two cases in addition to the standard paper case pack as described in section 4.5.2. The

following two sections analyse the differences between the streams with and without the computerised cases.

4.5.1 Development of the minimalist multimedia business cases

The minimalist cases were designed to contain the same content using only text and diagrams so that the main difference between the computer case and the paper-based cases would be the availability on the computer of searching and data manipulation facilities.

For the computer-based versions of the cases to be usable by the students, they had to be executable on no more than a base-level PC such as was available in the computer laboratories or in student laptops. In the summer of 1995 this was a 386 processor with 4MB running Windows 3.1 with VGA monitor. There was no scope within the MBA programme to provide additional tuition on the use of the cases so they had to be usable by students familiar with Windows and the standard Windows-based products used within the MBA.

A first prototype was produced using the Windows Help system to assess the software and to use as a discussion aid with lecturers. This had the advantages that the software was automatically available on all machines and the interface to searching, navigation and copying would already be familiar to students. However, the software was restricted in its provision of multimedia extensions and there were limitations on authoring facilities such as the availability of stop lists.

Microsoft Multimedia Viewer version 2.0 provided an extension of the Help compiler which did not have these limitations and offered a more pleasant development front end. The interface provided by Multimedia Viewer as default is the same as Windows Help. The run time system for playing titles is free and comes with a set-up program. This allowed it to be distributed with the cases and installed by the students.

Multimedia Viewer allows the topics in an on-line title to include text, graphics, sound and video. A number of navigation mechanisms through topics in a title are provided. A standard 'book browsing' interface is available through a contents button on the tool bar and the grouping of topics into topic groups (see figure 4.17). Unlike a book, topics not included in the contents page are not accessible through browsing. Hypertext links can be included within topics through hot-spots in text or graphics to provide alternative routes through the information or to information not available from the contents page. Pop-up windows can also be added to topics. Finally a text search facility (see figure 4.18) allows the user to search all text or text within a topic group. Stop lists can be used by an author to limit the effects of this full text searching. Back-tracking is provided in Viewer via Go Back and History buttons. Another standard feature provided by Viewer is the option to copy selected elements of the text in a topic.

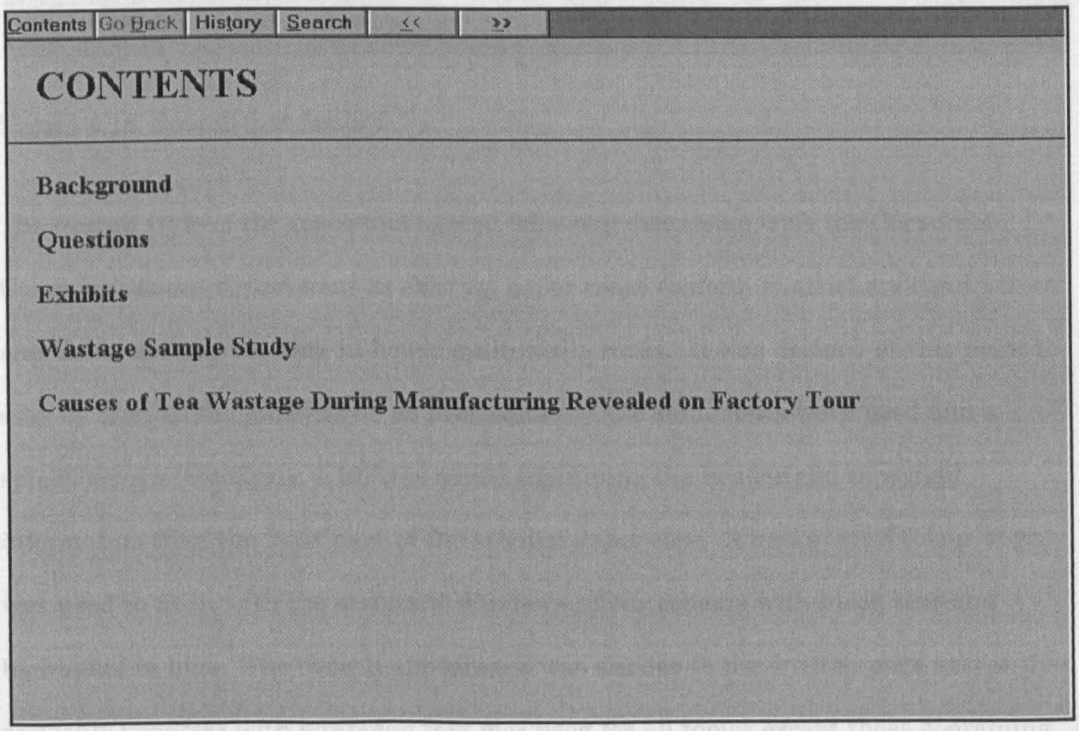

Figure 4.17 Contents page showing standard browsing buttons as well as a hot link to each section

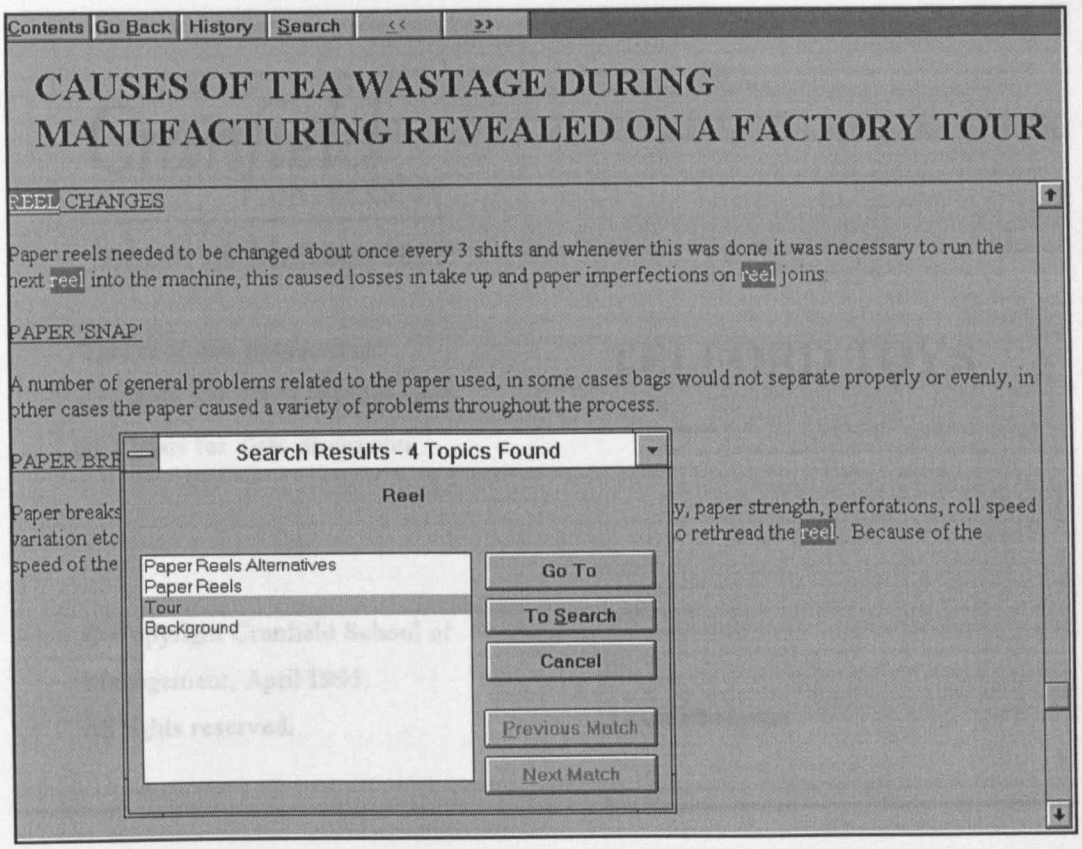

Figure 4.18 Search text facility

The overall style of the cases was agreed following discussion with the Corporate Communications department as existing paper cases conform to strict style guidelines and there were no existing in-house multimedia cases. It was decided at this point to stay as close to the paper style as practicable so the same fonts were used and a splash screen (see figure 4.19) was added containing the header and copyright information from the front page of the original paper case. A background colour of grey was used to fit in with the standard Windows colour scheme with black text and highlights in blue. The overall appearance was similar to the written page except that resizable windows with wrapping text was used for all topics except those containing tables of figures.

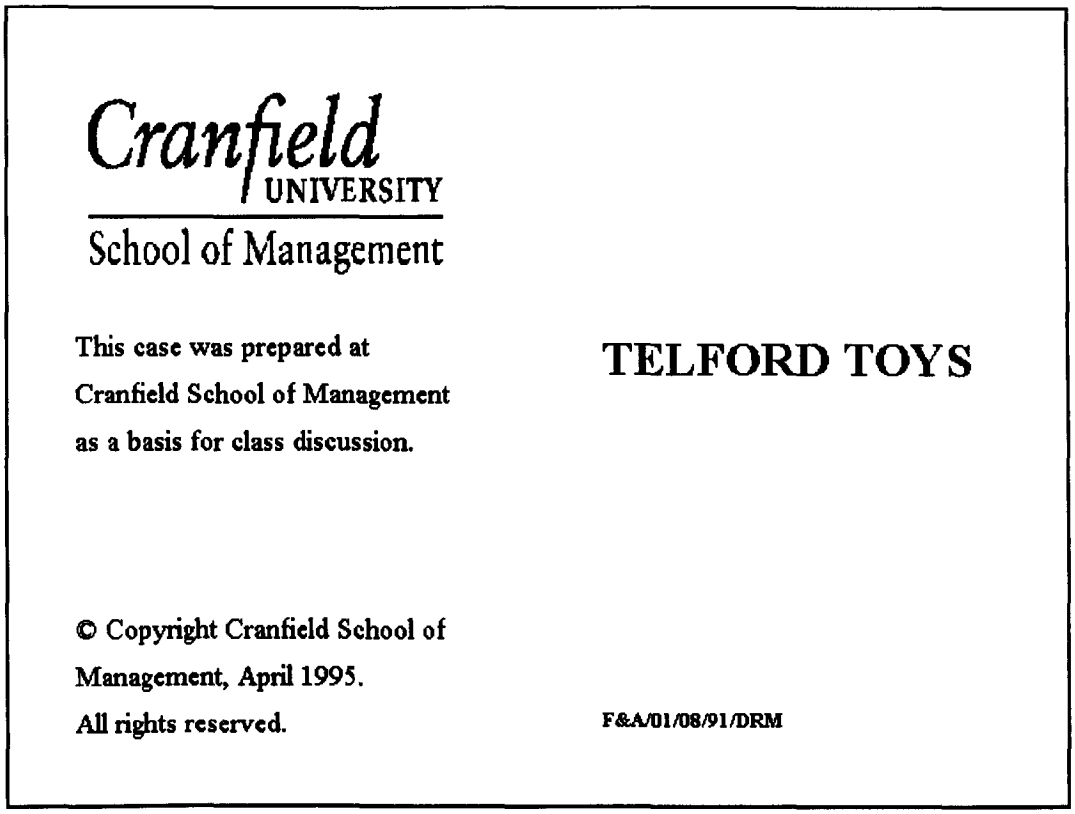

Figure 4.19 Splash screen

As far as possible, default Viewer options were used except that stop lists were used to limit searches for additional information. The material was divided into topic groups on the case background, case questions, various appendices and exhibits. The contents page contained links to all the sections in the original case pack. Hypertext links were only added when there were references to exhibits in the text.

4.5.2 The experiment

Each lecture on the core programme is based around a case and takes a similar format using the normal three stage approach to case based learning within MBA programmes. The purpose of the lecture is to go through the case making sure that all the students have the opportunity to understand the major learning points and providing the opportunity for extending the concepts. A student is called upon to lead by summarising the analysis and conclusions of their study group. During this time

other students will interject with questions or observations. After the initial lead, the discussion is opened up by the lecturer who ensures that the learning points are covered.

The idea of using machine readable cases was discussed with a number of lecturers from the groups teaching the core programme in term two. The objective was to find lecturers with cases which would benefit from machine readability (either because of number manipulation or text searching). They also had to be prepared to take part in an experiment where two streams (out of four) were given a computerised version of the case. Moreover, copyright issues ruled out using Harvard Business School cases.

The first two willing lecturers with suitable material were an operations management lecturer, J, who had a long standing interest in computer based learning and a finance professor, D, who did not use computers and had a slight reputation for being opposed to them but had a belief in continually improving the pedagogic value of the programme. From amongst their case packs two cases were selected and the other lecturers involved in delivering these cases were persuaded to take part in the experiment.

For each case, two streams were given the case on disk with instructions on the simple installation procedure. This was in addition to the version of the case in the paper case pack.

One study group from each stream was asked if they would video themselves as they discussed each of the two cases. For various reasons, four (out of a possible eight) videos were produced. Two groups videoed themselves for each case, one that had the case on disk and one that did not. Unfortunately all the videos were of poor quality and suffered from noise problems although those produced by a group in yellow stream, who met in a classroom and recorded themselves for both cases, were marginally better.

Two lectures were observed for each of the cases; one where the students had been given the computerised version of the case and one where they had not. In addition to taking notes, the lectures were videoed for subsequent analysis. In each lecture, the researcher was introduced and the presence of the camera explained. A static camera was used so it was not possible to get all students in shot (and the lecturer was not on camera). A single omni-directional microphone was used which picked up all the speakers but also picked up a lot of background noise (such as squeaking chalk and paper shuffling) sometimes drowning out the speaker. In addition to observing the lectures, the author had informal conversations with the lecturers and some of the students.

The next two sections describe each of the cases and discuss the findings from the observations.

4.5.3 Finance case: Telford Toys

The finance case, Telford Toys, concerned a proposal for an alternative production policy. It consisted of two pages of text together with tables of figures for the current balance sheets and profit and loss statements. Students were expected to calculate various financial indicators from the information provided. This case was converted so that the figures from the tables could be copied into a spreadsheet (see figure 4.20).

Blue and yellow streams were given the case on disk. Study groups from yellow and red streams videoed themselves and the lectures from blue and green streams were observed.

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EXHIBIT 1

£000	Dec 92	Jan	Feb	Mar	Apr	May	Jun
Pro forma balance sheets 1993 (seasonal production)							
a. Net plant and equipment	428	428	428	428	428	428	428
b. Stocks	212	212	212	212	212	212	212
c. Debtors	1,051	383	93	108	108	100	100
d. Cash	-	376	636	593	559	535	503
	1,691	1,399	1,369	1,341	1,307	1,275	1,243
Shareholders' funds	1,240	1,191	1,167	1,144	1,120	1,096	1,072
Long-term debt	160	160	160	160	160	160	160
d. Bank overdraft	146	-	-	-	-	-	-
e. Trade creditors	102	13	15	17	15	15	15
f. Tax liability	43	35	27	20	12	4	(4)
	1,691	1,399	1,369	1,341	1,307	1,275	1,243

Figure 4.20 Table of figures included in Telford Toys case

- **Observation of the study groups**

  Of the two groups, the yellow group seemed to like longer meetings and their discussion of each case lasted for about two hours whereas the red group's discussion was about one hour long. On the performances observed, yellow group was an average but conscientious group and the red group was at least as good if not better.

  In both groups a laptop was visible and was used during the session. Interestingly, given the low percentage of women on the course, a woman's laptop was used in both study groups.

  In yellow group, the student who appeared to be 'chairing' the discussion began by suggesting that they should not rely too heavily on one particular member of the group who obviously had a financial background because the rest of them wouldn't learn anything. He remarked 'you have to struggle with this stuff ... I

struggled with it for four hours last night.' As the financial student remarked: 'I'll tell you something about this case ... the issues that you have to get out of here, ie working capital management, are not brought to light because you are spending so much time doing mechanical scribing.' Another person in the group confided that 'I've got a serious problem in finance, I've haven't got a clue how to use a spreadsheet.' A couple of the others offered him suggestions on how to use the built-in computer tutorial and some notes that they had found useful in learning about spreadsheets.

There then ensued a round table discussion of the case based loosely on the questions posed in the case. The students were all sitting around a table referring to their copy of the case and their individual workings with the exception of the woman in the group who was referring to her workings on a laptop. She appeared to be using this in place of paper rather than as a means of calculating results during the discussion. As the group reached consensus on the approach they were going to adopt on a particular issue, each person annotated their own notes. The woman with the laptop seemed to use her machine to record her notes of the discussion. During the discussion one of the other students used her laptop to show someone how to cut and paste the figures from the electronic case.

In the red group a woman appeared to be using a laptop in a similar way. She was using it in an individual capacity and was not doing calculations for the group (others were using calculators) or recording decisions. This group did not have the case on disk but the background noise was such that it was not possible to tell whether they regretted having to key in the numbers.

- **Observation of the lectures**

The two lectures were taken by the same lecturer, D, a very experienced lecturer who had used this case many times before. In consequence they were very

similar in style and structure. As he recognised there was quite a lot in the case for a one hour lecture he took a fairly structured approach.

Each lecture began with D selecting a student to lead off on the case. In the blue stream, the student said they had spent a lot of time considering the numbers despite having used the electronic form. For the green stream, without the disc, the amount of time spent on analysis was reduced as illustrated by the comment: 'we added on the savings at the end rather than on the spreadsheet'. The different amounts of computer analysis performed by the two study groups was evident from the rest of the presentations. In the blue stream, when the student claimed to be uncertain when the overdraft would go over the current limit, because of some alignment problems over headings, he was heckled by several members of the class explaining how to do it. (A problem with the electronic form of this case meant that when transferring the headings and numbers to a spreadsheet for analysis, the headings could become misaligned by one column.)

In the blue stream, one study group had looked at the difference between including or excluding the savings proposed in the case. As no one commented on this in the green stream, D had to ask 'did anyone have a go at projecting the numbers after taking account of savings?' When no one responded, D said: 'Oh, then you'll be impressed by my model answer which does it both ways. ... Of course there is nothing to stop you doing it both ways if you have enough time but very often you don't have enough time.'

In the blue stream, an individual noticed a discrepancy in the figures given for shareholder's funds for the case. This led to a short discussion on what was a significant discrepancy. In the green stream during the initial discussion of the mechanics of the case, someone commented that they had looked at interest cover. Neither stream had identified the changes in interest receivable so D had to probe for this.

Half way into the one hour lecture, after thanking the students who had been asked to lead, D moved onto the production aspects of the case and both streams brought out similar points. After about fifteen minutes, D moved them on to marketing. Both streams commented on the need for counter-seasonal sales, blue stream talked about the relationship with customers and possible discounting, green brought up the need for 'accurate forecasting'. During the discussion on marketing, one of the students in green stream looking for a number, commented that he had 'too many pieces of paper here.'

At the end of the lecture, D focused them on a decision by saying 'what do we do?' In blue they talked a little bit about 'the bank manager's nightmare' and how that might be reduced by adopting only part of the proposal where as in green stream, he had to ask whether partial adoption was an option.

After the lecture, one student in the blue stream said 'the discs were superb', another asked about using the same technique for producing proposals but a third complained that the discs were no use because they were 'read only'. It transpired that this student did not understand the concept of cut and paste. This lack of understanding was manifested in at least one other student conversation following the lecture. Comments were also made by students about the alignment issue referred to earlier.

It was not possible to discuss the lectures with D on the same day and consequently his memory of the differences between the streams had blurred into his extensive memories of teaching this case. His view of the two lectures was that there was no difference between them.

The lecturer taking the unobserved streams, R, was more computer literate but less experienced as an MBA lecturer and was questioned on the same day as the case. She had been surprised that students had reported difficulties in formatting the copied spreadsheet and commented on the difficulty of satisfying

students' demands for spreadsheets without giving them all the answers. She felt that the disk was a sensible compromise. She also reported the same lack of understanding of cut and paste as had been observed in D's class. In summary she felt that the groups with the disc were on balance 'slightly more positive'.

Despite the poor quality of the videoed study groups, it did not appear that the disc made much difference to the groups' handling of the case and the use of the laptop as a largely personal tool was similar. The structure of the two observed lectures and the learning points which were exposed, were extremely similar probably because of the experience of the lecturer both with the case and handling MBA classes. Despite D's view that there was no difference, from an efficiency perspective, blue stream appeared to have a slight edge on green in that at least the lead student's study group had used a spreadsheet to carry out more extensive calculations. Moreover, this seems to have applied to other study groups in the stream in that they considered the effects of adopting the savings. In consequence, it could be argued that the blue stream were also slightly more effective although they did not think to consider interest receivable. This slight improvement in the stream with the disc is supported by R, the lecturer who was not observed.

4.5.4 Operations Management case: Cranbrooke Teabag Co Ltd

The operations management case four weeks later was about investigating the causes of wastage at Cranbrooke Teabag Co Ltd with a view to suggesting operations improvements. In the case pack there were four pages of background including a diagram of the production line, a wastage summary table and a fairly lengthy log of wastage details for each line for a period of two weeks. In addition 30 separate sheets of additional information were available to students from the lecturer provided they asked him the relevant question. These sheets contained explanations of processes and procedures, costs, organisational structures, human resource policies, and

environment considerations. In the electronic version, the material in the original case pack was available from the contents page, but the additional material was not and there were no hypertext links to it. This meant that students could only access it by using the text search facility. To ensure that commonly occurring words did not reveal all the additional information, these were included in a stop list. Students receiving the disc were told that for additional information they should consult the disc rather than the lecturer.

Green and yellow streams were given the cases on disc. The same yellow study group videoed themselves together with a group from blue stream who were slightly weaker than the yellow group.

- **Observations of the study groups**

  In yellow group's discussion of the operations management case, the woman had her laptop again but this time it was connected to a printer and was used more actively during the discussion.

  From the preliminary discussion of their individual work it was clear that they had successfully extracted the visible data into Excel and had manipulated it to identify the major causes of waste. Several of them had located some of the information on the disc which was not accessible from the contents page but some had experienced a nil response to their searching which they regarded as 'a big problem with the disc'. They believed they needed more information and decided to ring the lecturer from the classroom to check out whether this should be on the disc. In their description of the activities they had performed, no mention was made of searching for additional data. The lecturer was suitably evasive but assured them that the disc was complete. This was similar to the response he would have given to a group without the computerised version making a vague request about further information.

The group began a Pareto analysis using the whiteboard to aid the discussion. Gradually the two sitting on the other side of the table dropped out of the conversation and began working together on the computer. They did not appear to be doing anything particularly different from what they'd obviously done individually but suddenly, about an hour into the discussion, they found some relevant additional information (possibly by using a more specific search). They used this to help develop their recommendations to the problems that they had already identified. Subsequently, they searched for some further information to use in the same way. Once again individuals recorded their own notes of the discussion although something was printed out on the printer. However, when the video was turned off at the end of the consideration of that case, some of the sheets were still lying in the printer.

In the blue group, discussion of the case was shorter because there appeared to be a couple of individuals leading. This group had not had a disc and were using calculators not a laptop during their meeting. The camera angle was such that it was not possible to see all the students. They had completed the Pareto analysis to identify major causes of tea-bag wastage and it was not clear whether they had used a computer although it was not regarded as a significant task. They had acquired additional information from the lecturer and their analysis seemed satisfactory although, perhaps because of its length, the discussion was of a lower quality.

- **Observations of the lectures**

The lectures observed were taken by different lecturers. J, a very experienced lecturer, took the green stream who did not have the computerised case, while K, who was new to case-based teaching and the case, took the red stream who had the disc. J began his lecture by explaining that the case was about 'how do you improve the performance of an operation on an ongoing basis', and that 'instead

of as usual giving you all the information ... we were trying to get a bit closer to the way it is for real. You go into a company, if you don't ask the right questions, you don't have an adequate basis ... .' As he explained, he 'played every role apart from the consultant' whereas the other stream 'got the same information, hopefully, by interrogating the computer.' K made similar comments.

In operations management, a study group is asked in advance to present the case and in each stream this lasted about 20 minutes. The red stream, unusually for an operations management course, used a computer driven presentation. Both presentations used a Pareto analysis of the wastage rates to identify the main causes of wastage and presented the results as a table. In green stream, K interjected fairly early on to get them formally to identify the nature and size of the problem. This reflected a difference in style rather than any difference in the student performance.

After the presentation, J provided some more background to the case, whereas K said 'shall we go through and do the figures together?' Both streams then proceeded to look at the various sources of wastage in the case. It was clear from the reaction of the students in both streams that a similar minority hadn't found some of the necessary additional information. Students in green responded by 'it was given in the additional information' or 'you got that by interrogation' while in red, students referred to the need to go to J's office. Both streams seemed to have calculated the relevant numbers and green felt confident enough to correct K on a number of occasions; with J's experience, red did not need to do this. After about fifteen minutes of working on the numbers to compare the costs and savings of alternative solutions, K asked 'anybody do a fishbone?', the response being no, but they had thought about it. He used this to structure the rest of the lecture. J also prompted for a fishbone diagram of possible causes by putting up a slide but used this to summarise the findings to date. He went on to by asking

'where do we go from here?' which led to a discussion of sustaining process improvement.

In discussions at the front of the room following the class, in red I raised the possibility of scanning and this was acknowledged by several students but nobody admitted to using the scanning equipment to enter the numbers. However, the response to my question about using Excel's proof-reading facilities demonstrated a lack of knowledge of this feature.

The more didactic style of the operations management lectures meant that it was unlikely that there would be observable differences between the lectures unless there had been major differences in the amount of relevant information students located. Any other differences would have been masked by the large difference in style between the lecturers. Follow up discussions with lecturers on the same day supported observation from the lectures, that there were no discernible differences between the amount of additional information accessed by the two groups. The two lecturers were in favour of the use of a computerised form for this case, not least because J wouldn't have to sit in his office. As K pointed out, computer interrogation was a style that the students would have to use in the future to find out information.

4.5.5 Summary

A quasi experiment was set up providing information about two cases electronically in order that students' actual use of computers could be observed. A minimalist approach to developing a multimedia case was developed and a finance case and operations management case provided to two of the four streams on disc. Four study groups were self-videoed with limited success and lectures from two streams observed and compared.

When students were provided with information on disc they used it although surprisingly, given their computer attitude scale, they had difficulty manipulating the information. Despite the potential for increased efficiency (through not having to enter a significant number of figures or to arrange to see the lecturer to get additional information) this had a barely discernible effect on performance. Maybe this is a manifestation of the phenomenon noted by Galegher and Kraut (1990) that MBA students without computer support just work harder to complete assignments.

Student reactions to the discs were mixed, some being very enthusiastic while those who didn't know how to extract the information were less so. Faculty were generally in favour of the discs and recognised that this was a cost-efficient way of producing and delivering 'bread and butter' multimedia cases and which can provide an upgrade path, allowing more material and functionality (the 'jam') to be added as resources become available and the cases prove their usefulness (Oram 1996c).

4.6 FINDINGS AND CONCLUSIONS

This chapter has described the major research case study undertaken on the 1995/96 cohort of students on the Cranfield full-time MBA programme. The research involved three investigations into the students' attitude and behaviour when using computers in collaborative case based learning. This section brings together the findings from those investigations to discuss what has been learnt about computer support of collaborative case based learning by these MBA students.

Section 4.6.1 discusses the usefulness of this research case study in addressing the research agenda and assesses the conduct of the investigations. The next two sections consider the attitudes and behaviour of the MBA students to computers. The final section (4.6.4) considers the implications of these findings.

4.6.1 The study

The Cranfield full-time MBA provided a good source for investigation. It is a well-respected programme within the UK MBA market with a core course that is typical of such programmes. The use of computers by students has been established for many years but while there is a culture of computer use this is seen very much as a tool rather than a central part of the course delivery.

In the core course learning by case study is the dominant strategy. Cranfield makes explicit use of the three stage model described in 2.1.1. The entry requirement for the MBA means that most students have management experience. The collective experience of study groups is balanced to some extent by the policy of distributing the accounting expertise. Thus the case study approach used at Cranfield satisfies all the elements of the extended Laurillard learning model described in 2.2.1.

In section 2.2.1 the importance of the students' teaching style for the success of the Laurillard extended model was discussed. The need for Myers-Briggs types 'SJ' and 'NT' was identified. Of the students reporting their Myers-Briggs type (63), 34% were SJ and 54% were NT thus satisfying the requirement.

My relationship with Cranfield as former student and lecturer meant that access was good and I was in a position to understand the perspectives of faculty and students. However the faculty requirement to make each student experience as near identical as possible, constrained the research.

While the four streams of students taking identical courses provided a good opportunity for a quasi experiment, the need to make sure that each student was studying the same cases limited the possibilities in the investigation involving the resource-based computerised cases. It would not have been possible to introduce an existing multimedia case or to provide additional material in the form of video or sound. This

led to the development of the minimalist form of the multimedia case described in 4.5.1. As these cases mirror closely the paper-based cases, the interactions during stage 1 are similar with the computerised case as the 'story-teller' and the student as the 'researcher' (Laurillard 1994). In both paper and computerised cases, the remaining interactions in the extended Laurillard model are provided in stages 2 and 3 (2.2.1).

Due to the constraints on diverting student time it was not possible to formally interview students and responses to questionnaires had to be anonymous so the attitudes of particular students could not be linked to their observed behaviour.

4.6.2 Attitudes of MBA students

The computer attitude survey developed by Robertson (3.3.1) was completed by 123 of the 175 students. The results (4.3) show a group of students with a high computer attitude score compared with other non-technical audiences. With such a population a bi-modal distribution distinguishing the computer enthusiasts might have been expected but the distribution of scores is mono-modal. The high mean score and low variance indicate a population that regards itself as competent and enthusiastic in its computer use. This is consistent with the low attendance at the pre-programme and term 1 computer skills courses. This uniformity in the computer attitude scores meant that there was no need to consider separate populations in the subsequent investigations.

A qualitative questionnaire on the students' actual and desired use of computers during the three stages of collaborative case based learning was distributed at the start and end of the core course (4.4). For those students whose responses could be matched there was an overall increase in the amount of computer usage during all three stages.

Open coding of responses revealed that the most important use was for presentation ('professional looking reports which are easy to modify'). Even in stage 1 presentation was still regarded as an important purpose. The other purpose of computer use centred around the use of tools to improve the process ('collate, analyse and display data'). While this was most important during stage 1 it was also important during stage 2 ('pooling of analysis'). Half as many students commented on their desires for better or different computer support. Desires for more technology included 'better, faster PCs', 'network lines in each room' and rather less often 'data to be provided in electronic format'. However computer support in each stage was not viewed as a universal good with 24 students commenting to this effect.

These two investigations show a group of students who consistently believe they both like and use computers extensively at all stages of case learning. Moreover they see themselves as effective users of computers both as a tool and for presentation. In a climate where one student believed they were the 'only student on the course without a computer', there was pressure for better technology to be provided.

4.6.3 Behaviour of MBA students

A finance and a operations management case were converted to the minimalist computerised form described in 4.5.1 and given to two of the four streams of students in addition to the paper version of the case. Study groups and lectures from streams that did and did not have the computerised case were videoed and observed. The aim of the quasi experiment was to determine whether the computerised version was as good as the paper version and to see whether the availability of data in electronic form enhanced the learning experience in terms of efficiency or effectiveness. In addition by making the use of computers more explicit, the students' actual behaviour in using computers could be observed.

The restrictions of access meant that it was not possible to ask the two groups of students additional questions about the case. Moreover the MBA ethos is such that a student does what is required and no more and consequently any differences in effectiveness would not be easy to measure. Similarly efficiency could not be ascertained directly because it was not possible to interview the students or ask them to keep diaries.

Cranfield does not have any study group rooms where students can unobtrusively be observed so self-videoing was used as the least obtrusive alternative. There were a number of problems with the videoing: some of the groups failed to produce the videos and the camera angle and ambient noise level made some of the others difficult to interpret. Videoing of the lectures was more successful because they were also observed but still suffered from a fixed camera angle and noise levels.

The provision of the cases in computerised form was generally accepted. Some students used them to produce a paper case (despite already having a paper copy) while others made use of the data in electronic form. This use of the data in electronic form was dependent on individual student's competence. There were several examples of students in stage 2 providing remedial assistance and an example of students finding data collaboratively when they had been unable to find it individually. Some students were very enthusiastic about the computerised cases and faculty generally recognised their potential.

With a case such as the finance case, all streams of the MBA would normally be expected to perform equally as they will tend to work harder if necessary to achieve the same results. Consequently although the differences highlighted in 4.5.3 are slight they are indicative of an improvement in efficiency and effectiveness for students with the computerised case. With the operations management case the difference in lecturer styles masked any differences in student performance. The lecturers were in favour of

the computerised case because it allowed them to more easily and more realistically simulate the case.

Despite the limitations of the investigation it revealed an interesting disparity between the students' beliefs and abilities. In both the lectures and study groups there were numerous examples of students failing to exploit the data in the computerised cases because of a lack of basic computer manipulation skills. It was surprising that a student had got as far as term 2 knowing that he hadn't 'got a clue how to use a [computer] spreadsheet' without doing something about it (like take the term 1 course). Equally surprising was the complete lack of awareness of 'cut and paste' demonstrated by the student who regarded the computerised cases as 'read only'.

4.6.4 Conclusions

The development and use of minimalist electronic cases was a successful innovation providing a useful entry for a business school into the use of multimedia cases (Oram 1996c). The computerised resource-based cases improved efficiency and effectiveness where students had the computer skills to exploit the electronic data. There was some evidence that faculty could use the computerised case to extend the learning potential of a case by expecting more analysis.

The narrow range of computer attitude scores was not reflected in the students' behaviour. There was a marked dissonance between the students' beliefs and their actual behaviour when using computers (Oram 1996b). This difference was particularly influential because much of the computer use occurs during stage 1 when students are working on their own and so cannot benefit from the expertise of their study group. Unfortunately, the provision of computer courses to remedy a lack of skills depends upon the students recognising that they need help.

5 Part-time programme

This chapter describes the second of the three research case studies, the study of the 1996/97 cohort on the part-time MBA at Cranfield University School of Management. The syllabus of this MBA is essentially the same as the full-time MBA programme and the core programme is similarly taught through study groups of six students working on cases. However, the programme has made use of computer supported communication since 1988 to facilitate the study groups interaction off campus. The next section describes the structure of the programme and the profile of the students.

As with the full-time programme access to the MBA was facilitated by the author's long-standing relationship with the School. Once again, while lecturers and course officials were very helpful and supportive, investigations were limited to those which could be demonstrated to have no detrimental effect on student performance. The investigations undertaken were the computer attitude survey and study of computer support of case based learning as with the full-time MBA, and an analysis of the use of computer conferencing. The data collection is described in section 5.2 and the analysis of each investigation in the subsequent sections.

Findings and conclusions from this study are presented in section 5.6. The effectiveness of the study is assessed and findings summarised from two perspectives: the attitudes of the students to computers and their behaviour when using computers. The chapter concludes by highlighting issues in these findings.

5.1 PROGRAMME

The part-time MBA programme at Cranfield University School of Management is known formally as the Executive MBA Programme. Introduced in 1981, it 'is designed to allow

managers to undertake [...] the Cranfield MBA without interrupting their careers' (Cranfield 1996 p16) and as such aims to provide the same student experience as the full-time programme.

The programme lasts for two years divided into four terms. Year 1 of the programme is the core course which lasts for two terms. Year 2 consists of a mixture of elective courses and compulsory courses figure 5.1. Assessment is by examination at the end of each term, class tests, written assessment of case exercises and various other elective specific methods. Years 1 and 2 must be passed separately. Students attend Cranfield for four residential weeks and seventeen weekends (Friday and Saturday) in the first year (ie the core course). During these residential periods students are almost exclusively timetabled for class work so that most individual study and study group work has to be undertaken off site.

The syllabus of the core course is the same as the full-time programme and in some subjects the case packs and lecture notes are identical apart from the timetable. Successful year on year developments in one programme will be reflected in the other. For the part-time programme 'the study group is [the student's] life support system'. (Cranfield 1994b p 7) and unlike the full-time programme students stay in their same study group throughout the core course. Thus the collaborative case-study is very much the dominant strategy for the core course of the programme.

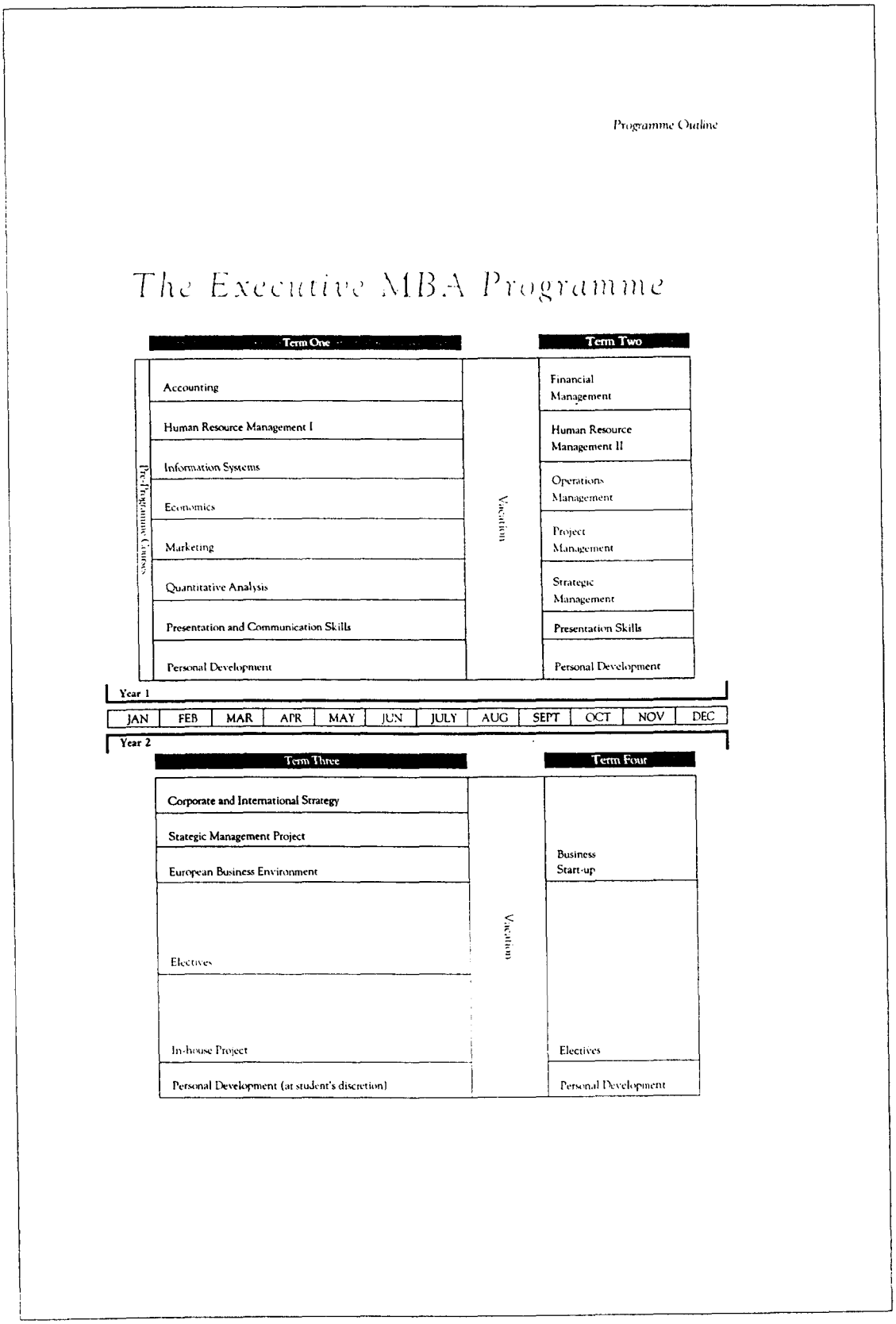

Figure 5.1 Cranfield Executive MBA Programme (Cranfield 1994b p5)

Unlike the full-time programme, the use of computer support is integral to the part-time programme. Students are required to possess a personal computer, printer, modem and appropriate software. On enrolment, students are given a copy of Lotus Notes and support on its use is available. This provides email and computer conferencing. Conferences are set up for each study group, for General Issues and if the lecturer wishes, to complement courses. In addition, the School facility of a laboratory of 30 PCs with standard office software and a range of scanning and printing facilities is available. Similar facilities are also provided within the library during opening hours.

As with the full-time cohort studied, the entry requirements for the 1996/97 part-time MBA programme were a first degree, at least three years business experience, a GMAT[1] score of at least 620 and satisfactory references and interview. The students are mainly between 26 and 36 and are typically sponsored by their employer. The age and career profile are regarded as similar to the full-time programme but no statistics are published. Typically the programme recruits a small percentage of women students (16%) but understandably few overseas students.

The students in an annual cohort are divided into two streams giving four streams in total (in 1996 blue and yellow are year 1 and red and green are year 2). In the cohort studied the recruitment was low (61) but normally the streams are of similar size to the full-time programme. Each stream is taught separately but frequently lecturers teach both streams and generally assessments are the same or similar across streams and across programmes. Courses are taught in parallel throughout the term as illustrated on the timetable for term 2 shown in figure 5.2.

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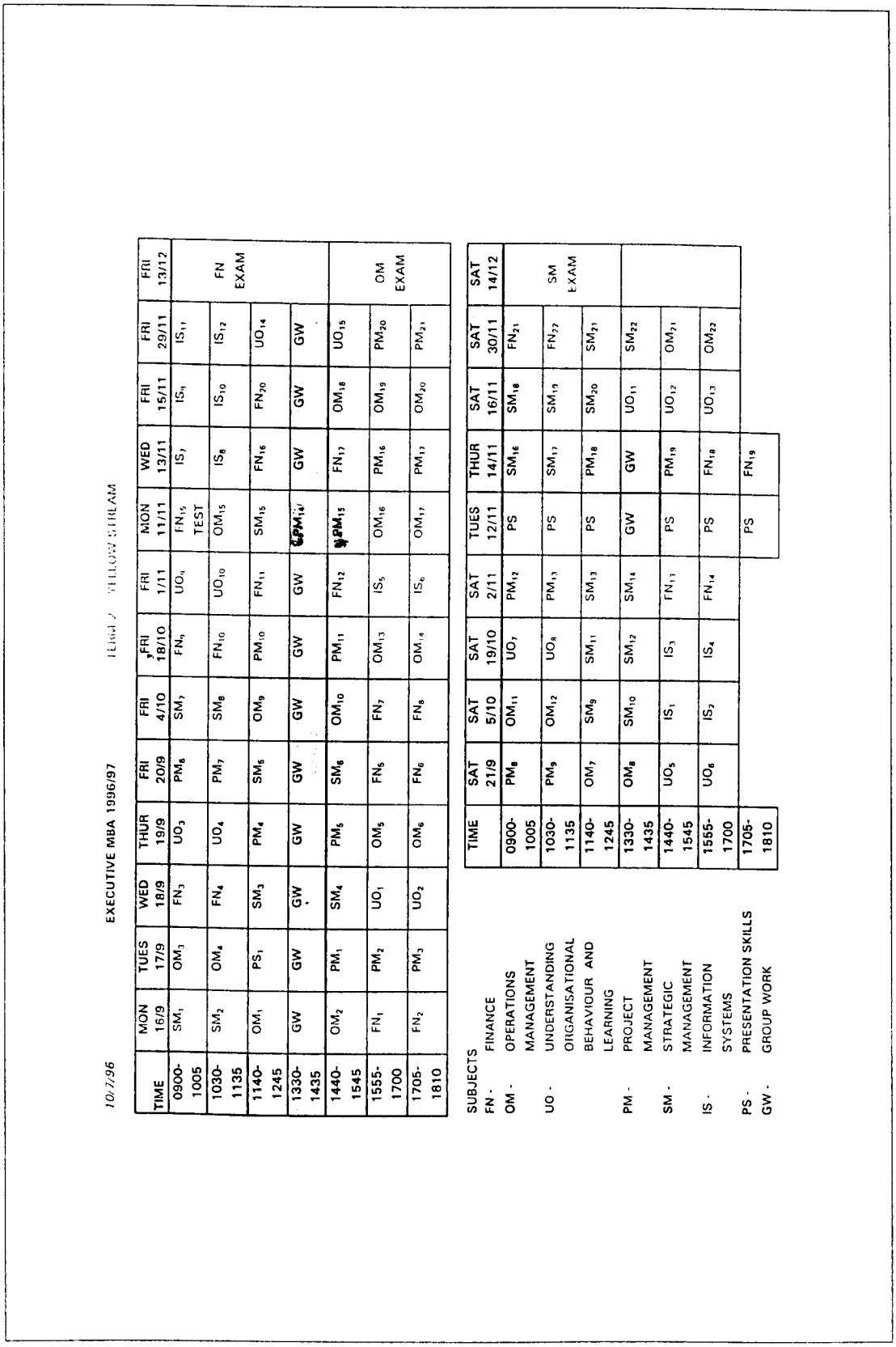
[1] General Management Aptitude Test - a US based measure of aptitude for graduate management courses widely used as an admissions criterion in the UK.



10/7/96 EXECUTIVE MBA 1996/97 [illegible] YELLOW STREAM

TIME	MON 16/9	TUES 17/9	WED 18/9	THUR 19/9	FRI 20/9	FRI 4/10	FRI 18/10	FRI 1/11	MON 11/11	WED 13/11	FRI 15/11	FRI 29/11	FRI 13/12
0900-1005	SM_1	OM_3	FN_3	UO_3	PM_6	SM_7	FN_9	UO_9	FN_{15} TEST	IS_7	IS_9	IS_{11}	FN EXAM
1030-1135	SM_2	OM_4	FN_4	UO_4	PM_7	SM_8	FN_{10}	UO_{10}	OM_{15}	IS_8	IS_{10}	IS_{12}	
1140-1245	OM_1	PS_1	SM_3	PM_4	SM_5	OM_9	PM_{10}	FN_{11}	SM_{15}	FN_{16}	FN_{20}	UO_{14}	
1330-1435	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW	
1440-1545	OM_2	PM_1	SM_4	PM_5	SM_6	OM_{10}	PM_{11}	FN_{12}	PM_{15}	FN_{17}	OM_{18}	UO_{15}	OM EXAM
1555-1700	FN_1	PM_2	UO_1	OM_5	FN_5	FN_7	OM_{13}	IS_5	OM_{16}	PM_{16}	OM_{19}	PM_{20}	
1705-1810	FN_2	PM_3	UO_2	OM_6	FN_6	FN_8	OM_{14}	IS_6	OM_{17}	PM_{17}	OM_{20}	PM_{21}	

SUBJECTS

FN - FINANCE
OM - OPERATIONS MANAGEMENT
UO - UNDERSTANDING ORGANISATIONAL BEHAVIOUR AND LEARNING
PM - PROJECT MANAGEMENT
SM - STRATEGIC MANAGEMENT
IS - INFORMATION SYSTEMS
PS - PRESENTATION SKILLS
GW - GROUP WORK

TIME	SAT 21/9	SAT 5/10	SAT 19/10	SAT 2/11	TUES 12/11	THUR 14/11	SAT 16/11	SAT 30/11	SAT 14/12
0900-1005	PM_8	OM_{11}	UO_7	PM_{12}	PS	SM_{16}	SM_{18}	FN_{21}	SM EXAM
1030-1135	PM_9	OM_{12}	UO_8	PM_{13}	PS	SM_{17}	SM_{19}	FN_{22}	
1140-1245	OM_7	SM_9	SM_{11}	SM_{13}	PS	PM_{18}	SM_{20}	SM_{21}	
1330-1435	OM_8	SM_{10}	SM_{12}	SM_{14}	GW	GW	UO_{11}	SM_{22}	
1440-1545	UO_5	IS_1	IS_3	FN_{13}	PS	PM_{19}	UO_{12}	OM_{21}	
1555-1700	UO_6	IS_2	IS_4	FN_{14}	PS	FN_{18}	UO_{13}	OM_{22}	
1705-1810					PS	FN_{19}			

Figure 5.2 Timetable for term 2 of core course on part-time MBA

The collaborative case method used on the core course is the same three stage model used on the full-time programme, the only differences arising from the physical distribution of the students for study group work. Study groups work in a variety of ways: meetings (either off-site or at Cranfield), exchanges of faxes, telephone calls and computer-mediated communication (email and conferencing). Despite the potential difficulties for group work with part-time students, the Cranfield MBA expects students to make their study groups work: 'The course is designed so that you can not possibly do all the work yourself and therefore you need to make sure that your group works well with every member contributing equally.' (Cranfield 1994b p 7)

5.2 INVESTIGATIONS

Three of the investigations described in 3.3 were undertaken for the part-time programme. The attitude of the students to computers was investigated using the computer attitude survey (3.3.1) and the computer support of case based learning qualitative questionnaire (3.3.2). Demographic data (sex, first or preferred language, age) was collected about students to assist in the interpretation of their computer attitude scores.

Computer conferencing has been a central part of the computer support provided for the part-time students since 1989 (Sweeney and Oram 1992). The final investigation (3.3.5) studied the students' use of computer conferencing. The Lotus Notes study group conference for one arbitrary study group from each stream was copied (with the study group's permission) at the end of the year. In addition the General Issues and Finance conferences were copied. These copies contain all the messages that were not explicitly deleted by participants during the year.

The data collected for each investigation is shown in figure 5.3.

Investigation	Questionnaire 1	Computer conferences copied	Questionnaire 2
Computer attitude survey	✓		
Computer support of case based learning	✓		✓
Computer conferencing		✓	
Demographics	✓		

Figure 5.3 Data collected for each investigation

The research was presented during the initial orientation sessions. Questionnaire 1 was administered via student pigeon holes during the first week of the MBA after the students had worked on their first case. Questionnaire 2 was similarly administered just before the start of part 2. Following the administration of each questionnaire, students were prompted by email and a letter to return their questionnaires.

Overall the response rates to the questionnaires were good with 36 of the total population of 61 (59%) returning the first questionnaire and 16 (26%) the second. Unfortunately exam numbers only allowed the responses from the two questionnaires to be correlated for 5 students. The exam number was duplicated in three cases in questionnaire 1 and not given in 8 cases (7 in questionnaire 1 and 1 in questionnaire 2); these responses have been treated as separate students in the analysis.

Of students responding to the first questionnaire 6 (17%) indicated they were female out of 10 (16%) in the population. One respondent did not indicate their sex. The average age was 32.6 with ages distributed as shown in figure 5.4. This is similar to the full-time distribution of age except that there are no students below 26 and the oldest student is five years older.

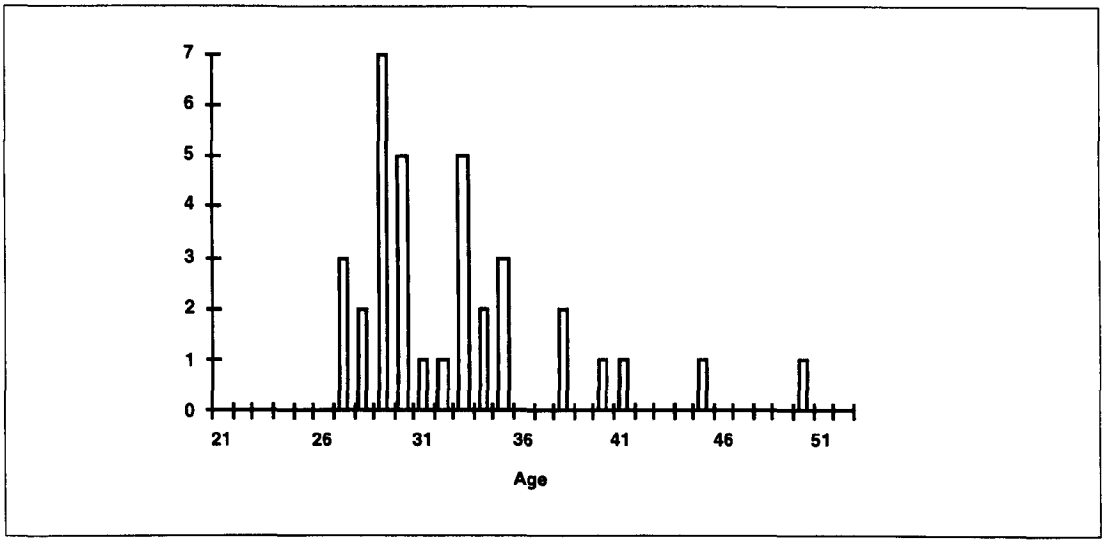


Figure 5.4 Age distribution of respondents, n=35

The next three sections describe the conduct and findings of each of the investigations: computer attitude survey, computer support of case based learning and computer conferencing.

5.3 COMPUTER ATTITUDE SURVEY

The computer attitude survey sought to provide a context for the other investigations. In particular the survey establishes the shape of the distribution of attitudes to computers at the start of the programme. The survey instrument is described in section 3.3.1.

The survey measures attitudes to computers on the sub-scales described in figure 3.2. The averages and variances for the sub-scales and overall scale on a range of 1 (low) to 5 (high) are shown in figures 5.5 and 5.6.

Sub-scale	Mean	Variance
Anxiety	4.00	0.34
Confidence	3.97	0.16
Cognitive	3.79	0.09
Behaviour	3.77	0.26
Liking	4.08	0.36
Use	3.38	0.22
Competence	4.06	0.47
Computer Attitude Scale	**3.87**	**0.14**

Figure 5.5 Results of attitude survey (35 respondents, 6 female)

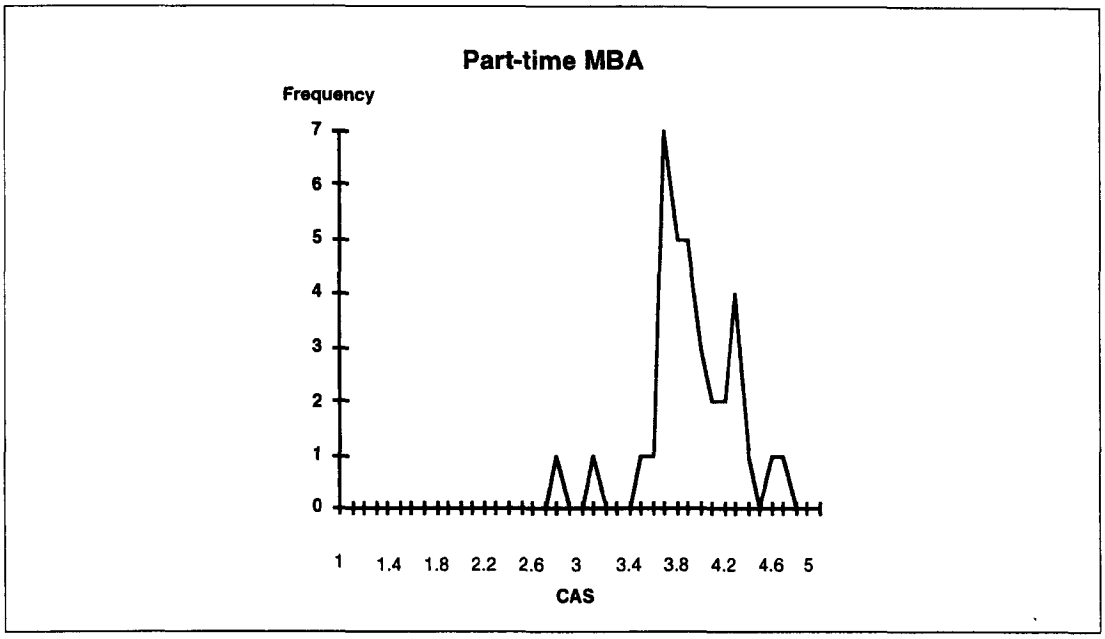


Figure 5.6 Distribution of Computer Attitude Scale, n=35

The figures shows values for all respondents. Differences in attitudes between men and women were not investigated because of the small sample size.

In interpreting these results, the notable feature is the high averages across the sub-scales and relatively low variances. Only one respondent had an overall score of less than 3. A comparison with the results obtained by Robertson et al (1995b) are shown

in figure 5.7. The part-time MBA students scored higher than the secondary teachers or parents on all sub-scales except use but lower than the technical OU students (see 3.3.1 for a description of Robertson's populations).

Sub-scale	**Mean**			
	OU students	**This study**	**Secondary teachers**	**Parents**
Anxiety	4.16	4.00	3.64	3.60
Confidence	4.25	3.97	3.80	3.49
Cognitive	3.83	3.79	3.62	3.48
Behaviour	4.02	3.77	3.23	3.63
Liking	4.22	4.08	3.56	3.40
Use	4.02	3.38	3.56	3.84
Competence	4.17	4.06	3.71	3.28
Computer Attitude Scale	**4.07**	**3.87**	**3.63**	**3.51**
Number of respondents	60	35	65	28

Figure 5.7 Comparison with results from pocket book study (Robertson et al 1995b)

The attitude survey indicates that the MBA students were generally positive about computers. The narrow band of scales recorded and the shape of the distribution indicate that in the other investigations of the part-time MBA programme there is no need to consider subsets of the population by computer attitude scale.

5.4 COMPUTER SUPPORT OF CASE BASED LEARNING

This study set out to establish the student's views on how computers can support case-based learning. The open-ended questionnaire (Appendix B) focusing on the 3-stage model of case analysis was the same as that used in the full-time study. Students were asked why they used computer support in each stage and what additional support they would like or use if it were available.

In the first questionnaire, students were asked how much they expected to use some form of computer support in each of the three stages and in the second questionnaire, how much they had used computer support. Students used computer support rather more than they expected (see figure 5.8) although these differences may be due to the different populations answering each questionnaire (as questionnaires could not be matched on exam number as in the full-time study).

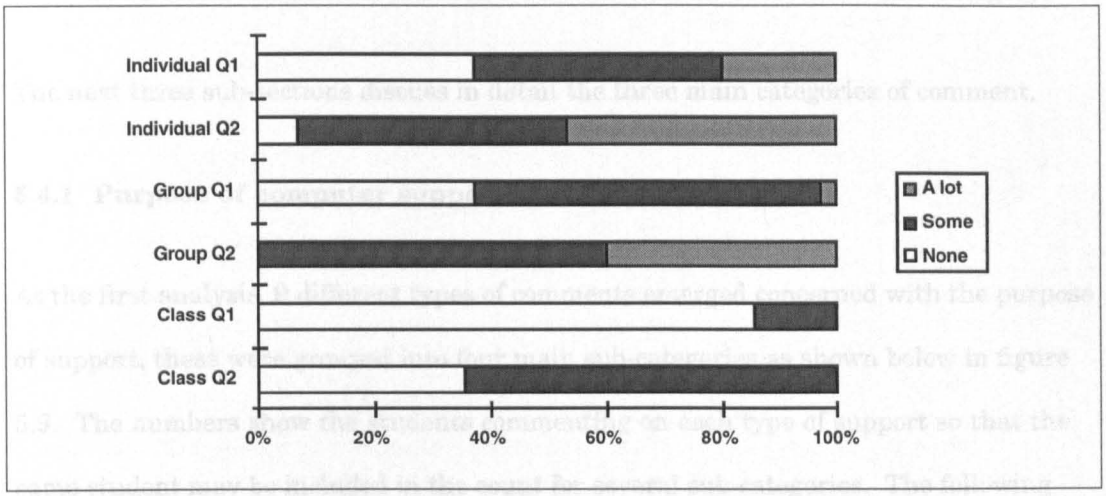


Figure 5.8 Use of computers during individual, group and class work on case studies, n=46

Of the 47 students who replied to either or both questionnaires, 39 made some sort of response to the open-ended questions. Responses from these 39 students were analysed using NUD•IST as explained in the next section.

The comments about computer usage were coded using an open-coding approach with one category scheme for all questions using NUD•IST's indexing techniques to distinguish between responses about individual, group and class work (see 3.3.2 and appendix C). Distinguishing between students on the basis of age was considered but was not undertaken because of the large proportion (28%) who did not indicate their age.

From the open coding three main categories of comment emerged:

respondents (38 of 39) commenting on their purpose in using computers to support case study work,

respondents (14 of 39) commenting about their desires for computer support or complaining about the absence of facilities,

and a small collection of uncoded comments that didn't fit into either category.

The next three sub-sections discuss in detail the three main categories of comment.

5.4.1 Purpose of computer support

At the first analysis, 9 different types of comments emerged concerned with the purpose of support, these were grouped into four main sub-categories as shown below in figure 5.9. The numbers show the students commenting on each type of support so that the same student may be included in the count for several sub-categories. The following sub-sections discuss each of these four sub-categories.

Sub-category	Number of students commenting (out of 39)
Data manipulation	28
Presentation	18
Computer-aided learning	8
Business game	4
Computer-based learning	5
Communication	21
Group communication	15
Lotus Notes	13
Process improvement	18
Circulate-confirm-expose	11
Efficiency-effectiveness	5
Project management	3

Figure 5.9 Frequency of comments made about purpose of computer support

- **Data manipulation**

  The comments were almost all concerned with analysing and summarising data using both spreadsheet and word processor. At one level this was seen as a convenience but some students went further and indicated that more analysis was possible with computer support.

  'Convenient, flexible, text can be manipulated easily. Numerical work much clearer' e96121

  'To assist in carrying out numerical analyses and to prepare and present reports, WACs, etc.' e96150

  'Many possibilities can be analysed quickly and in a traceable fashion' e96116

While data manipulation was most often mentioned in the context of the individual work on cases (89% of those who commented on data manipulation), it was also seen as important in group work (50%).

- **Presentation**

Many of the comments under this heading were concerned with the production of slides for presentation in class. However, these students seemed equally concerned about issues of presentation that affect individual and group work including the quality of presentation and the ability to distribute results to others easily.

'Preparation of slides (Powerpoint & WP)' e96101

'It produces higher quality work (especially graphs), better presented, quickly and more effectively' e96115

'Can show options prepared in advance without having to print out.' e96116

'easy for others to read, can produce multiple copies without photocopies' e96137

'Other people's notes typed up and easier to read.' x00012

Comments were equally distributed between individual, group and class work with most students only commenting in one of these areas.

- **Computer-aided learning**

There was some support for computer-based learning which is provided for the Quantitative Methods course amongst others. There were a small number of students who would have liked more.

'Exercises (intended in QM at least I think)' e96132

'CBT - learning aid and attainment tests' x00014

The Business Game, which is part of year 2, is not automated for the students but some of them expected to use spreadsheets to assist with playing it.

'Bus Game but we didnt use it the 'game ' was just fed into it' e96141

'We used spreadsheets to help with calculations in the Business Games' e96161

- **Communication**

Communication was an area where there were many comments mostly highlighting how the use of, particularly, Lotus Notes supported group communication.

'Lotus notes used to facilitate group discussion / enquire around cases / projects whilst not at Cranfield. Provided a consise mechanism for debate / communication' e96157b

'Helps group interaction.' e96121

"To record notes and numeric workings for later reference. Also these are printed out and copies to the work team' e96155

There were a few comments about actually using Lotus Notes, some positive and some negative.

'Can't wait to use Lotus Notes - great pity this wasn't all set up before we arrived so it was ready for use, with boxes etc. from Day 1' e96161

'More support for getting set up on Lotus Notes' e96112

'LOTUS NOTES - problems with databases' e96140

Not surprisingly, comments about communication were almost exclusively made in the context of group work (90%).

- **Process improvement**

A number of students made the point that the computer supported the process of circulate-confirm-expose within the study group.

'Useful for exchanging ideas, parts of a group assessment, comments etc in a group forum eg learning team rather than airing ideas across the entire course' e96103

'To confirm ideas' e96114

'To share information amongst the learning team To review / edit case analysis' e96148

Students also expressed the view that the process of case analysis was made more efficient, effective and better managed through the use of computers.

'Efficient, Quality of output, Access to information' e96116

'Speed; easy access, easy to correct or alter, use of a laptop means I take it wherever I go' e96137

'Calculating the effect of decisions was done more quickly on a spreadsheet (eg. balance sheet) so we discussed more options in the given time' e96155

'we are planning to use it for creating work databases with pre and post work planning (timetable)' e96126

The majority of comments related to group work (89%) although process improvement was also important in individual work (44%).

5.4.2 Desires for computer support

At the first analysis, 6 different types of comments emerged concerned with the student's desires for computer support, these were grouped into three main sub-categories as shown below in figure 5.10. The following sub-sections discuss each of these three sub-categories.

Sub-category	Number of students commenting (out of 39)
Enhanced equipment	3
Scanner	2
Video conference	2
Better support of process	4
Remote access to information	2
Computerised lecture notes/slides	2
Technology doubts	11

Figure 5.10 Frequency of comments made about desires for computer support

- **Enhanced equipment**

  There were two specific requests for enhancing the equipment: scanning and video-conferencing. Interestingly, Cranfield provides scanning and OCR facilities in the Computer Studio.

  'Ability to scan in eg pictures diagrams' e96103

  'Ditto [scanner] for sending printed material via Notes' e96115

  'Video conferencing facility (multi party)' e96116

- **Better support of process**

  The areas where students wanted better support for the process were in remote access to information and computerised lecture notes.

  'Additional reading / references when away from Cranfield via modem' e96107

  'Ability to search information sources from home computer' e96116

  'Lecture notes to be available each week in soft format (so I can carry the entire course with me wherever I go)' e96155

- **Technology doubts**

  In contrast to the small numbers of students desiring more technology, rather more students expressed some doubts over the capability, particularly, of current technology. This was most notable in the area of presentation systems.

  'Computer generated overheads instead of via printing slides but seeing the agro the others had getting it set up I'm glad we didn't !!!' e96101

  'Computers in syndicate areas with large screens/projection ability (technology's not quite there yet perhaps)' e96116

  Some students doubted the benefit of computers in classwork (and in one case individual work).

  'I find a laptop more cumbersome in class than hard copy or taking written notes' e96115

  The remaining comments were generally transient problems with the technology.

  'Printer not working in computer room' e96140

  'Correct disks sent out and on time' e96147

  More doubts about technology were expressed in the context of class work (73%) than for group (55%) or individual(45%) work although typically those who made comments had doubts in several areas.

5.4.3 Uncoded views

Some of the comments made in response to the questionnaire did not code to the categories discussed previously and mostly indicated a misunderstanding of what was being asked. They came from questionnaire 2, that is a year after the introduction and related to the support facilities that were available suggesting that the preamble to the questionnaire had not been read.

'Made little use of Facilities at CUSOM Most resource employed was sourced from employer' e96149b

5.4.4 Summary

This study considered how the students perceived their use of computers to support case based learning. The relatively small number of responses (39) and the difficulties encountered in matching responses from questionnaires 1 and 2 means the quantitative results presented should be treated as indicative.

By the end of the core course computers were used extensively with no students saying they did not use computers for group work and only 7% of students saying that they didn't use it for individual work.

From the open-coding it can be seen that a substantial number of students (72%) used computers for data manipulation, principally for analysis and summarising, during their individual or group work on a case. Presentation was mentioned rather less (46%) but was equally used during all stages of the case method. Various forms of computer-aided learning were used by 21% of students. Over half the students (54%) commented on the use of tools, primarily Lotus Notes, to support group communication and interaction almost exclusively during the group stage of analysis. A large number (46%) also commented on other ways that the computer supported the process of case-work.

On the whole students were happy with the provision of technology (only 6 students suggested additional facilities) but a 11 students expressed some doubts over the capability or usefulness of current technology.

5.5 COMPUTER CONFERENCING

The computer support of case based learning study examined the students' perceptions of their use of computers. The student's actual use of computer conferencing was observed by studying copies of their conferences. These contained all the messages sent during the year which were not explicitly deleted by students.

Each study group had a conference; one conference for a study group from each stream was copied. There were also conferences associated with each subject and a more general conference for the cohort. This 'General Issues' conference and the Finance conference were also copied. The number of messages in each conference are shown in figure 5.11.

Conference	**Number of students participating out of the possible participation**	**Number of messages**
Blue stream study group	6 out of 6	230
Yellow stream study group	4 out of 6	64
Finance	16 students out of 61 2 staff	70
General Issues	40 students out of 61 7 staff	273

Figure 5.11 Conferences copied for analysis

The participation rate by students varied considerably. In the blue stream study group half the students sent between 6 and 15 messages whereas the other half sent between 55 and 74 messages. In the yellow stream study group, three of the participating students sent between 8 and 16 messages whereas the other student sent 31 messages.

The participation in the two cohort-wide conferences are shown in figures 5.12 and 5.13. These figures illustrate that most people sent a small number of messages; in the Finance conference over half the participants sent 1 or 2 messages and in the General Issues conference 1 to 3 messages. In both conferences there were a small number of individuals who sent the majority of the messages. These figures represent contribution not participation; there was no way available to find out the number of people reading these Lotus Notes conferences.

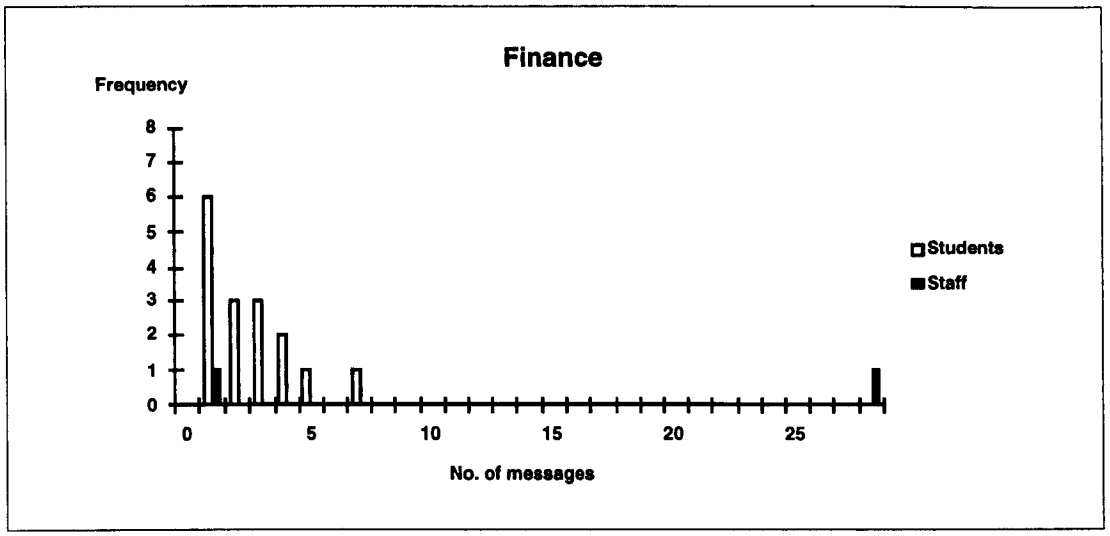


Figure 5.12 Frequency of students or staff sending messages in the Finance conference

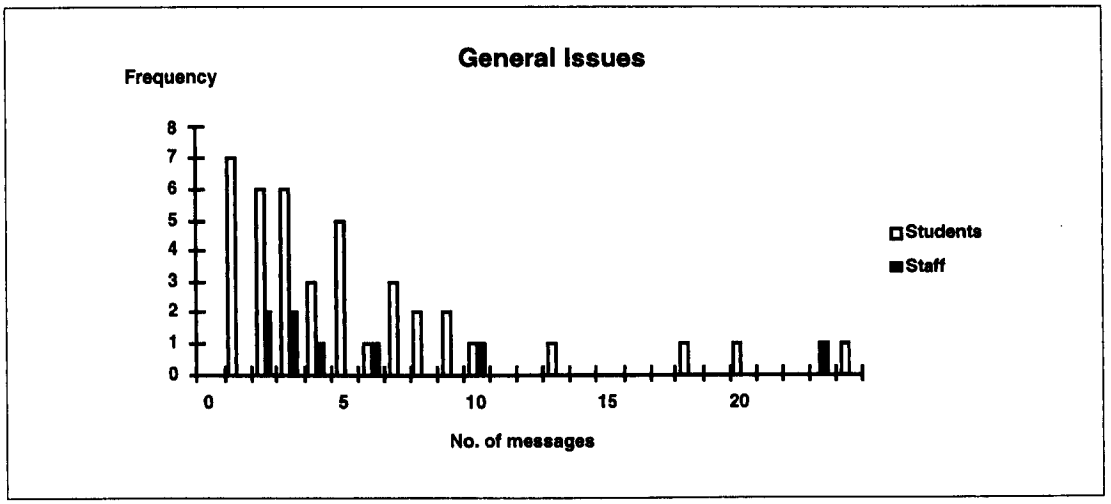


Figure 5.13 Frequency of students or staff sending messages in the General Issues conference

The conferences were analysed according to their structure (see section 5.5.1) and content (5.5.2 and 5.5.3). This analysis is incomplete because it was not possible to collect data about other forms of communication used by students. This is particularly relevant to the analysis of the study group conferences. In giving their permission to observe the conference, the Yellow stream group said 'we tend to use the email rather than the Yellow [group number] database'. In the Blue stream group some of the messages include attachments where the content of the attachment is not clear from the message (attachments were not available for analysis). They also used fax, email, mail and telephone in parallel to conference messages (eg 'Has anyone got any thoughts on the faxes you should have all received', 'Attached document as per my email', 'Unfortunately I missed the last post on Friday so they have only gone off this morning', 'If they haven't arrived by Thursday morning can one of you get on the blower to me asap so I can send them an alternative way'.)

5.5.1 Analysis of structure

In Lotus Notes a conference is divided into categories and within a category, a topic identifies a new thread of discussion. A user has the option when reading a message to add a comment or start a new topic. New categories reflect major areas of work and were created at the request of the study group.

In the blue stream study group there were two topics in the 'Project Management' category ('Warehouse Contract' and 'Presentation') as shown in figure 5.14. Each line shows the date and subject of the message, the author's initials and the number of responses. The indentation indicates which message the author was commenting on, so for example IP joins the 'Warehouse Contract' thread for the first time on 7/11/96 (last message in that thread) by commenting on MC's original message.

```
Project  Management

11/10/96       Warehouse Contract  (MC, 20 responses)
13/10/96         warehouse  (JW, 1 response)
13/10/96           me again  (JW)
13/10/96         Yep  (KN, 2 responses)
16/10/96           MS Project  (MC, 1 response)
16/10/96             well played MC  (JW)
14/10/96         Eager to see the computer  (VK, 13 responses)
22/10/96           Project Update  (MC, 12 responses)
22/10/96             Yes - but carry on  (VK, 1 response)
23/10/96               (JW)
24/10/96             Should the rest of us be doing something?  (VK, 9)
25/10/96               Just to frustrate you all!!  (MC, 8 responses)
25/10/96                 sshh  (JW, 1 response)
04/11/96                   Further discussions....  (MC)
05/11/96                 Further thoughts (a copy)  (VK, 5 responses)
05/11/96                   "depends!"  (JW, 1 response)
07/11/96                     Project Plan as we updated last weekend (MC)
07/11/96                   Await Party Pains advice  (VK)
07/11/96                   crane issue  (KN, 1 response)
10/11/96                     More on cranes  (VK)
07/11/96         materials spreadsheet  (IP)

25/11/96       Presentation  (KN, 7 responses)
25/11/96         Panic!!  (MC, 2 responses)
25/11/96           What?  (DL)
26/11/96           For the second time  (VK)
25/11/96         A change of tack KN?  (VK, 2 responses)
26/11/96           confused  (JW)
27/11/96           Good show  (KN)
26/11/96         Slides for perusal  (VK)
```

Figure 5.14 Messages in blue stream study group project management category

The lengths of the threads (the number of messages on the same topic including the initial message) for each category in each conference are shown in figures 5.15, 5.16, 5.17 and 5.18. The use of categories was sometimes confused, for example in the 'Business environment' category in the General Issues conference several messages relate to football results after a discussion message made a passing reference to the Euro'96 results. There are also some categories where new topics have not been started when it might have been appropriate to do so. In consequence the number of messages shown in each thread in the figures are on occasions inflated, in particular, the second thread in UO-Groupwork in the Blue Stream study group's conference is more like a separate category.

Category	Number of threads	Thread lengths including initial message
Accounting	4	8, 6, 3, 2
Economcs[sic]	3	5, 3, 1
General	2	2, 2
IS/IT	2	4, 9
Marketing	7	3,3,4,2,1,6,2
Marketing Success Story	2	7, 15
Operations Management	1	11
Project Management	2	21, 8
statistics [sic]	1	2
Understanding Organisations & Learning	1	15
UO - Groupwork	2	3, 65

Figure 5.15 Structure of the blue stream study group conference

Category	Number of threads	Thread lengths including initial message
Accountancy	3	4, 1, 1
Marketing	5	4, 1, 1, 1, 1
Operations Management	1	1
Project Management Project	3	1, 3, 1
Strategic Management	1	1
UOL Project	14	2, 1, 1, 1, 3, 8, 1, 1, 1, 3, 1, 1, 4, 1
Video Presentation	1	3
WAC	3	2, 2, 2
Workload	2	1, 1

Figure 5.16 Structure of the yellow stream study group conference

Category	Number of threads	Thread lengths including initial message
Admin	7	3, 1, 3, 1, 1, 1, 3
Barland	8	1, 6, 8, 1, 3, 3, 23
DCF	1	4
Investment Game	2	2, 1
Lecture Notes	6	1, 1, 1, 1, 1, 2
Lowry	3	4, 2, 1
Shares	1	2
Slides	2	1, 1
Welcome	2	1, 1
Wesselec	2	6, 1

Figure 5.17 Structure of the Finance conference

Category	Number of threads	Thread lengths including initial message
Administration	2	1, 1
BE WAC	2	5, 6
Bulmer	1	2
Business environment	3	2, 29, 11
Electives	4	1, 4, 1, 5
Events	4	2, 4, 5, 6
Feedback	1	22
FOOTBALL	1	8
General	8	1, 1, 2, 2, 12, 2, 1, 9
In company Project	1	4
Learning Teams	1	7
Library	1	12
Lotusnotes [sic]	7	2, 22, 6, 13, 4, 3, 7
problem	3	6, 5, 3
RECORD CHANGE	1	1
Social	1	6
Software	4	1, 1, 1, 1
The Lighter Side	4	6, 4, 1, 6
(Not categorised)	2	1, 3

Figure 5.18 Structure of the General Issues conference

In all the conferences thread lengths were generally short with some notable exceptions. The difference between the two study groups is quite marked as shown in figure 5.19 and demonstrates their different use of conferences. (For presentation purposes the graph does not include blue group's 65 message thread.) The yellow stream study group used Lotus Notes mainly as an announcement system. This is explored further in section 5.5.2 where the content of the study group messages is discussed.

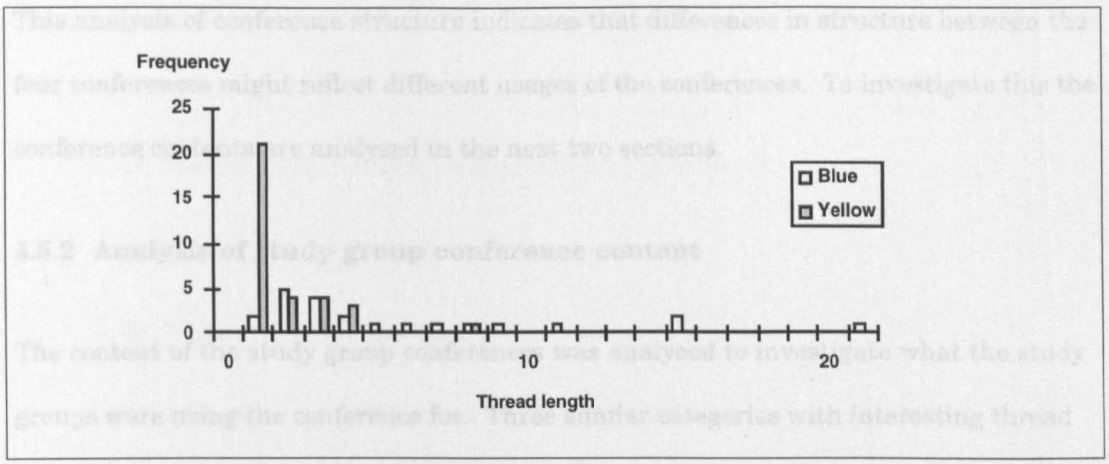


Figure 5.19 Thread lengths in the study group conferences

There are also differences in thread length between the two cohort conferences (see figure 5.20) which reflect their different usage. The Finance conference was set up to complement and supplement finance lectures and was dominated by the Finance lecturer who was a Lotus Notes enthusiast. In contrast the General Issues conference has a mixture of categories with a few social (some pre set up and spontaneous categories), several mistakes and administrative notices and questions. The difference in content is further discussed in section (5.5.3).

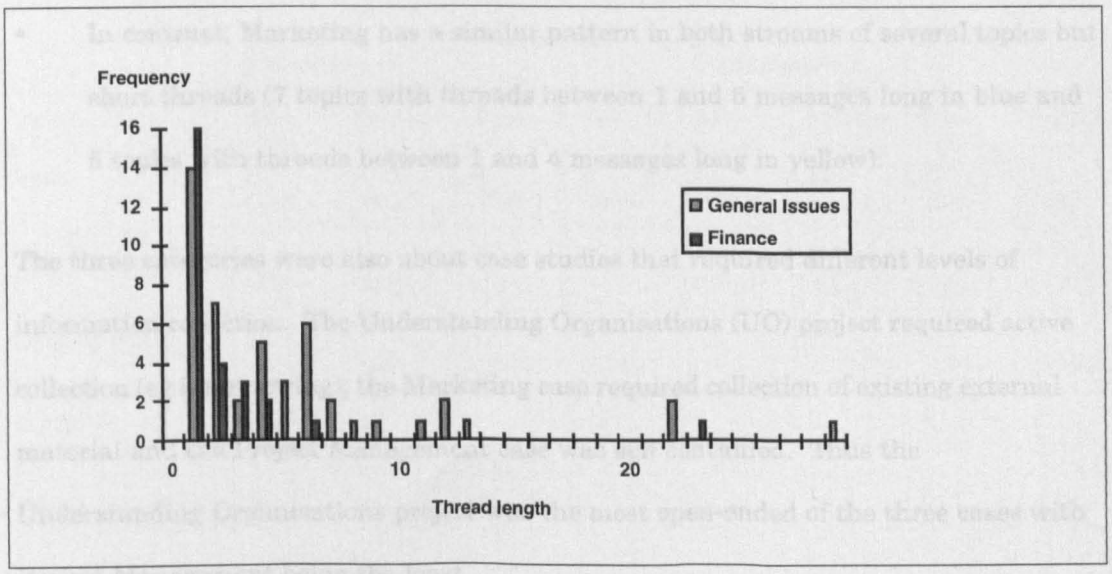


Figure 5.20 Thread lengths in the cohort conferences

This analysis of conference structure indicates that differences in structure between the four conferences might reflect different usages of the conferences. To investigate this the conference contents are analysed in the next two sections.

5.5.2 Analysis of study group conference content

The content of the study group conferences was analysed to investigate what the study groups were using the conference for. Three similar categories with interesting thread patterns were selected from each of the study group conferences for detailed analysis using NUD•IST (see appendix C):

- Project Management (Project Management Project in yellow stream) was chosen because in blue stream it contains only two topics with a relatively substantial number of messages (21 & 8) whereas in yellow stream it has three topics with very few messages (1, 3 & 1).
- UO - Groupwork (UOL Project in yellow stream) also had different structures in the two streams (2 topics in blue with one containing most of the 68 messages, 14 topics in yellow many of them containing only 1 message).
- In contrast, Marketing has a similar pattern in both streams of several topics but short threads (7 topics with threads between 1 and 6 messages long in blue and 5 topics with threads between 1 and 4 messages long in yellow).

The three categories were also about case studies that required different levels of information collection. The Understanding Organisations (UO) project required active collection (eg interviewing); the Marketing case required collection of existing external material and the Project Management case was self contained. Thus the Understanding Organisations project was the most open-ended of the three cases with Project Management being the least.

Considering the messages in both the study group and cohort conferences a number of message purposes were identified. Four of these were concerned with learning:

Task - issues to do with tasks students had been given

Coordination - of work on those tasks

Dissemination - of information

Discussion - where at least two messages debated management issues

The three other purposes were:

Administrative - to do with administration of the programme

Social

Uncoded - for messages not fitting any of the above categories

The messages were analysed in each category according to these purposes. Figure 5.21 shows the number of messages in each type (with some messages having more than one purpose).

	Project Management		**Marketing**		**UO - Groupwork**		**Combined**	
Purpose(s)	**Blue**	**Yellow**	**Blue**	**Yellow**	**Blue**	**Yellow**	**Blue**	**Yellow**
Task	15 (52%)	4 (80%)	16 (76%)	3 (38%)	50 (74%)	13 (45%)	81 (69%)	20 (48%)
Coordination	13 (62%)	1 (20%)	1 (5%)	0	18 (26%)	6 (21%)	32 (27%)	7 (17%)
Dissemination	3 (14%)	3 (60%)	4 (19%)	5 (63%)	14 (21%)	15 (52%)	21 (18%)	23 (55%)
Uncoded	3 (14%)	0	1 (5%)	0	2 (3%)	1 (3%)	6 (5%)	1 (2%)
Total messages	29	5	21	8	68	29	118	42

Figure 5.21 Classification of message purpose(s) for different categories in the study group conferences (with % of total messages in a category)

- **Task**

These messages were concerned with the group reporting progress on the task and any variances:

'Think, it is likely to be too recent to appear in the Cranfield library. I will try and phone Body Shop direct today to get them to send me a copy.' (Blue Marketing)

'Impressed with the charts produced as well. There seem to be umpteen varieties of cashflow profiles but a few permutations on Excel should be ok. Timing does become an issue when the equipment is likely to be left idle i.e. imposes a constraint even if not explicitely stated if we are trying to maximise profit.' (Blue Project Management)

'I agree about limiting it to fragrances. I think we might be able to cut down on some sub-topics eg only do certain parts of the relationship marketing model.' (Yellow Marketing)

Any chance of another copy of the interview schedule amended to show who we actually interviewed please? I need it for the "what we learned paper". I scribbled on my copy and don't still have it on the database! Sorry!' (Yellow UOL Project)

There were also messages on issues peripheral to the main task:

'By the way for those with enough time to read the New Scientist, they had a good article on using neural networks, logic links but NOT regression which failed to make sense of the vast amount of data these cards produced, even mentioned supermarket managers using the new tools.' (Blue Marketing)

'My system refuses to recognise this as a Powerpoint presentation. Is it something to do with version number?' (Yellow UOL Project)

Both groups used messages to clarify the main task although yellow group used this proportionately less than the blue group. For both groups there were more task messages for the more open projects.

- **Coordination**

Coordination messages were about future actions to bring together the work of individual group members, that is convergent rather divergent coordination. Messages tended to be in two styles; an expansive list of actions to be carried out:

'Firstly, may I remind you that we agreed to assemble in Cranfield on the evening of the 28th but we didn't name time.

I don't think it will be a productive use of our time if we have to wait till all six of us present, if one of us is going to be particularly late.

Can we suggest times by which we can make it please to get an idea?

Secondly spoke with V today and we agreed that it may be useful for some of us to get together in advance of the 28th in order to get a headstart, so that all we need to do is ratify the content and practice the presentation.

Thirdly can someone verify the following:

1. We brainstormed the 'Lessons learned for us' section

2. Someboby took notes on the above

3. IP is going to add this to work done by JW and MC this week

4. JW's sexyterry is going to reproduce the Price Waterhouse slide the role of culture.

5. DL is going to have a go at producing the diagnostic diagram at the end of the handout we were given, i.e. the model of the 'functional / dysfunctional org.'

Latest schedule attached. I am assuming that:

A & I can come to London on Tuesday 29th

S can come to London on Wednesday 30th

I know A could come to London on the morning of the 30th but if I could come all day on the 30th then A would not need to come on that day. Clear as mud! ' (Blue UO - Groupwork)

Or a more cryptic style (in this instance all in the subject line of the message):

'Subject: dataHi Guys - can you read your WAC notes and start commenting ASAP. I has kindly agreed to go to the library on Friday - think we need to comment on what information we would like if possible. I would suggest a copy of the Bodyshop audit or some info about that (ask V about it)A couple of general articles from marketing type mags about the Bodyshop to get a flavour.May be worth checking general relationship articles written by Adrian or Martin as they may have done something that summarises this area or even a similar case.Does anyone else have any ideas? - get replying so I knows what we think.Big thank you to I for doing thisJ' (Blue Marketing)

Coordination messages were used much more extensively by the blue group (presumably because the yellow group were using email for these types of message). For the blue group coordination messages were more apparent in the self-contained project management case.

- **Dissemination**

These messages were concerned with the circulation of relevant or irrelevant information to members of the study group often in the form of attachments. This can also be viewed as divergent coordination.

Most messages with this coding were brief comments relating to attached files:

'Case study as promised. No question as such, therefore loads of feedback' (Blue Marketing)

'Here is the output of this evenings work by the southern softies around at D's house.' (Blue UO - Groupwork)

'Suggested structure and outline schedule (in Excel) attached.' (Yellow Marketing)

'Here is a first draft plan for the Warehouse contract, some ideas for the presentation and control of the contract. It would be useful if you could have a look at them before the weekend if possible. Don't get too hung up with the detail in the spreadsheet.' (Yellow Project Management Project)

However occasionally information was disseminated in the text of the message:

'Gosh this is getting all exiciting. Re: cranes if we extend clad 1 to 4 weeks implication will be

1. Only 1 crane required for the clad 1 job i.e. two crane max on site.

2. Existing : cost of 2 cranes for two weeks = £5100x2x2 = £20,400

cost of 1 crane for 3wks + 1wk = £4100x3 + £5100x1 = £17, 400 (saving £3000).

3. Accomodation required over the 4 weeks will be 2 labourers, 1.5 skilled effectively 2 skilled, 1 crane driver = 5. As this will encroach on weeks 10 -13, no spare accomodation (extra electrician takes up the spare room) , therefore will require 2 extra cabins = £3000x2 = £6000.

4. Therefore lose money overall, unless we play about with the scheduling. On the other hand the extra cabins may give us more flexibility. ' (Blue Project Management)

The yellow group used the conference for dissemination more than the blue group both in terms of number and proportion of messages. More dissemination messages were sent for the open-ended cases.

- **Discussion, Administrative and Social**

  Surprisingly there were no messages where the study group members discussed substantive issues in the case. Rather, messages focused on how the tasks might best be accomplished. Perhaps less surprisingly there were no messages coded to Administrative or Social.

- **Uncoded**

  These were some messages with no text but usually a file attachment or cryptic messages often using only the Subject line of the message.

  'Subject: Now I know what it is missing' (Blue Project Management)

  'Subject: ssshh' (Blue UO - Groupwork)

There was also at least one incomplete thread indicating that a message starting a new topic had been deleted by the sender.

When they did use the study group conference, the yellow stream study group used it mainly for disseminating information and to a lesser extent for messages concerned with the task. The blue stream study group favoured coordination of future activities and messages about working on the current case study. Neither group used their conferences for discussion of the issues of the case study or for communication about social issues or events. The lack of extended threads when compared with the cohort conferences is indicative of the absence of discussion. The connection between thread length and discussion needs to be viewed with caution; for example the 65 long thread in the blue study group's 'UO - Groupwork' conference is actually a collection of much smaller threads.

The use of conferences by the study groups for organising and coordinating tasks and for the dissemination of information indicates that the use of conferences may have

made the students more efficient. However, the lack of discussion suggests that the conferences did not make them more effective.

5.5.3 Analysis of cohort conference content

The contents of the cohort conferences are regarded as less relevant to the research as they were not concerned in the main with the study of the cases. In consequence they were analysed in less depth. The analysis was only by conference and each message was coded only to its main purpose directly from the Lotus Notes conference. The distribution of message purposes is shown in figure 5.22.

Purpose	Finance conference	General Issues conference
Administrative	13 (19%)	81 (30%)
Dissemination	11 (16%)	19 (7%)
Discussion	30 (43%)	64 (23%)
Social	0	73 (27%)
Uncoded	16 (23%)	36 (13%)
Total messages	70	273

Figure 5.22 Classification of message purposes for the cohort conferences

In these cohort wide conferences discussion and social messages were present. Social messages were not limited to the nominally social categories (Social, The Lighter Side, FOOTBALL). The following two lines at the end of a twenty one line message taking part in a discussion in the Business Environment thread, lead to nineteen messages about football in the same thread:

> *'Those at Wembley last night (and 20 million others) might think the world has already ended anyway!' (General Issues)*

In the strongly lecturer led Finance conference (40% of messages were from the lecturer) discussion dominated often starting with a dissemination message from the lecturer. This resembled an electronic tutorial and on occasion the lecturer even came in at the end of a discussion to make some summarising and concluding remarks. As with face to face tutorials run on the full time programme, participation is limited. The General Issues discussion was broader and on at least one occasion was triggered by a guest lecturer. Typically the discussion was not related to the case studies.

In the Finance conference all of the dissemination messages were from the course lecturer, frequently as attachments, and consisted of lecture notes, supplementary material or model answers. In the General Issues conference dissemination messages were more varied: some were concerned with the use of Lotus Notes, some from students sharing information on a large assessed case study, some from students on software, particularly about viruses, and a few on changes to library opening hours.

The largest category in the General Issues conference was for 'Lotusnotes' (21% of the messages); most of these were coded to administrative. This category contained question and answer messages about the use of Lotus Notes. However there were messages throughout the conferences which suggested that the students did not fully understand the operation of the conferencing system or the concept of threading.

> *'Subject: Hi I had this problem despite regular re-freshing notes - eventually I tried clicking on every button I could find and I found some "hidden notes" which it asked me if I wanted to do something with - can't remeber what happened so suggest you click on everything going - always been my strategy and never fails! Happy clicking' (General Issues)*

> *'I think it would be more helpful if successive comments amendments came in here not in general mail as it gets too difficult to keep track.' (General Issues)*

Within these cohort wide conferences dissemination seems to have been used effectively and discussion occurred where it was triggered by a lecturer or some external event. There is some evidence that the use of these conferences did improve both efficiency and effectiveness for those students participating but that this was related to their general learning on the MBA rather than specifically case based learning.

5.5.4 Summary

The conferences observed covered the whole of the core course ie ten months. That means that on average each student sent less than one message per month (0.4 messages per month) to the General Issues conference. Looking at students who sent at least one message the average rises but it is still less than one per month (0.7 messages per month). For the blue stream study group conference the figure is still less than four per month (3.8 messages per month). Given the overall number of conferences, most students participating in conferences probably sent less than 5 messages per month with a small number of students sending considerably more.

This participation is disappointing given the maturity of the use of Lotus Notes on the part-time programme. Those students who used Lotus Notes for conferencing had some problems with the technology. As there is no formal induction into the use of Lotus Notes in the programme it could be that lack of familiarity with the technology is preventing more students from using it.

Where students did use conferencing, it seems to have been an effective dissemination medium (and there may have been many students who read disseminating messages without commenting). Although the yellow study group did not (by their own admission) use the conference they sent more dissemination messages than the blue group. Dissemination was also used for a variety of purposes in the cohort-wide conferences.

The absence of discussion messages in the study group conferences, particularly in blue group, was surprising but perhaps reflects a preference by students for using their limited face-to-face opportunities for discussion of a case. In the cohort-wide conferences discussion occurred either when it was triggered by additional material from the lecturer (in Finance) or where there were no face-to-face opportunities for discussion (as with the 'Business Environment' category in the General Issues conference).

One of the problems with this investigation was that it was not possible to include all the ways in which a study group communicated and some of them communicated by email, phone, fax, mail as well as the conference and face-to-face. In consequence it is difficult to identify specifically what the conference contributed to their learning efficiency or effectiveness. However, the analysis suggests that overall students' efficiency was increased by their use of conferencing as a dissemination mechanism and for some it aided task organisation and coordination. There is no evidence that conferencing increased students' effectiveness at learning through case studies although the more general discussion may have improved some students' overall learning effectiveness.

5.6 FINDINGS AND CONCLUSIONS

This chapter has described the complementary research case study undertaken on the 1996/97 cohort of students on the Cranfield part-time MBA programme. The research involved three investigations into the students' attitude and behaviour when using computers in collaborative case based learning. This section brings together the findings from those investigations to discuss what has been learnt about computer support of collaborative case based learning by these MBA students.

Section 5.6.1 discusses the usefulness of this research case study in addressing the research agenda and assesses the conduct of the investigations. The next two sections

consider the attitudes and behaviour of the MBA students to computers. The final section (5.6.4) considers the implications of these findings.

5.6.1 The study

The Cranfield full-time MBA studied in chapter 4 did not provide an opportunity to study the use of email and computer conferencing in case based learning. This study of the Cranfield part-time MBA provides a good opportunity to remedy this deficiency. The part-time core programme covers the same material with the same strategy of case based learning, but in contrast to the full-time programme, computers and especially computer conferencing is an integral part of the programme. The maturity of the conferencing provision makes it a good source for investigation.

Despite the part-time nature of the programme and the physical distribution of students (they come from all over Britain and occasionally from Europe), the same three stage model (2.1.1) for case based learning is used. In providing computer conferencing Cranfield sees it supporting collaboration at a distance during stage 2 (Sweeney and Oram 1992). In the Laurillard model (Laurillard 1994) this is a discussion with student and teacher as 'negotiators'; the extended model (2.2.1) views it as discussion between students.

My relationship with Cranfield meant that access to the part-time programme was good although I was less able to understand the perspectives of these students (I had been a full-time student). However the constraints imposed by faculty and the practical constraints of part-time students restricted the research.

Although the part-time programme contains two near-identical streams it was not possible to negotiate a quasi experiment for computer conferencing so the inherent behaviour of the students had to be observed. Observation was limited to computer conferencing because it was not practical to observe study groups in situ (eg a pub in

Reading) or to capture other forms of communication. Due to the constraints on diverting student time it was not possible formally to interview students or ask them to keep diaries. Responses to questionnaires had to be anonymous so the attitudes of particular students could not be linked to their observed behaviour.

5.6.2 Attitudes of MBA students

The computer attitude survey developed by Robertson (3.3.1) was completed by 35 of the 61 students. The results (5.3) show a group of students with a high computer attitude score compared with other non-technical audiences. With this population a distribution reflecting age might have been expected (the youngest was only 11 when the IBM PC was launched whereas the oldest was 35) but age was not a significant factor in the distribution of scores. The high mean score and low variance indicate a population that regards itself as competent and enthusiastic computer users. This uniformity in the computer attitude scores meant that there was no need to consider separate populations in the subsequent investigations.

A qualitative questionnaire on the students' actual and desired use of computers during the three stages of collaborative case based learning was distributed at the start and end of the core course (5.4). Open coding of responses revealed that the most important use was for data manipulation and other process improvements ('Calculating the effect of decisions was done more quickly on a spreadsheet (eg. balance sheet) so we discussed more options in the given time'). While data manipulation was most important in stage 1, communication and other process improvements were more often mentioned for stage 2 ('to share information amongst the learning team'). The other purpose of computer use which was commented on equally for all three stages was presentation ('easy for others to read'). A third of the students commented on their desires for better or different computer support mainly concerned with having information in a computerised form ('lecture notes to be available each week in soft

format'). However 11 students cast some doubt about the use of technology ('a laptop is more cumbersome in class than hardcopy or taking written notes').

These two investigations show a group of students who consistently believe they both like and use computers extensively at all stages of case learning. The effects of their daily contact with the 'real world' are reflected in a pragmatic attitude to the use of computers with less interest in technology for its own sake. Not surprisingly, given the problems of group work for part-time students and the provision of computer conferencing, computer support of communication was seen as important but only for group work.

5.6.3 Behaviour of MBA students

The behaviour of the students in using computer conferencing was investigated by studying some of the conferences. The conferences were primarily seen as support for collaboration in stage 2, but as discussed in chapter 2 (figure 2.7) there is also the potential for email to be used for question and answer in stage 1 and computer conferencing to be used in stage 3 for dissemination. It was not possible to replicate email using the Cranfield system but conferences were replicated for two study groups and for two cohort wide conferences to investigate the use of conferencing in stages 2 and 3.

There were some technical problems with replicating conferences arising from the Cranfield installation which were overcome. There was no way available to detect the presence of students who only read messages. Conferences were replicated several times during the year but only the final conference was analysed since it was clear that students were not doing housekeeping or deleting messages wholesale. A few messages were obviously deleted by students because of their content.

Despite the integral nature and maturity of computer conferencing within the part-time Cranfield MBA, it was used surprisingly little with students using (perhaps preferring) many other forms of communication. The conferences tended to be dominated by a few people and were clearly not used as the prime medium by the study groups analysed. Within the study groups, the use tended to be for synchronisation and dissemination rather than discussion. This is completely the opposite to the communication observed in the videos of study group discussions in the full-time programme (see section 4.5). If the finance conference is compared with the lectures observed in the full-time programme then the discussions are very thin and involve far less student participation. While the use of conferencing did not improve the effectiveness of the students it may have helped to improve efficiency for those students who used it.

Analysis of the conference structure revealed a lack of expertise and discipline in using the conferencing tool despite the students' high attitude scores. Inappropriate comments were added to topics leading to long threads which were off category (such as the 19 messages about football in the Business Environment thread) or not related (such as the 65 messages in one thread in a study group conference). The Lotus Notes category in the cohort wide conference contained many examples of students being unaware of some basic concepts in Notes.

The students did receive some paper-based notes on the installation of Lotus Notes (with a pack of 18 installation diskettes) and a brief guide on sending and receiving mail. The remaining documentation was provided through the General Issues conference. This tended to be of a problem-solving nature rather than explaining the underlying model of computer conferencing. Although this training on Lotus Notes was rather minimal, no comments were made in the conference about the training, although a student asked in the computer support of case based learning questionnaire (5.4) for 'more support for getting set up on Lotus Notes'.

5.6.4 Conclusions

When computer conferencing was first introduced to the Cranfield part-time MBA in 1989 the technology limited its usefulness (Sweeney and Oram 1992). Seven years on the technology has improved considerably but use has not kept pace. The use of computer conferencing on the Cranfield part-time MBA is mature, is a required element of the programme, has good support and enthusiasm amongst some of the faculty and yet the uptake is limited. Although two thirds of the students contributed to the General Issues conference the overall number of messages sent by most students was low (estimated to be no more than 5 per month across all conferences).

The use of conferencing by most students was more akin to a noticeboard rather than a conference with messages concentrating on task coordination and on dissemination of information rather than on discussion. It was clear that most students used many forms of communication to overcome the problems of being part-time and that computer conferencing was one of the least preferred methods. The narrow range of computer attitude scores was not reflected in the students' behaviour with a few enthusiasts, a large number of occasional users and many non-participants. There was a noticeable dissonance between the students' beliefs and their actual behaviour when using computer conferencing.

6 Distance learning programme

This chapter describes the third of the three research case studies, the study of the 1996 cohort on the stage one module (B800[1]) of the Open University Business School MBA. This MBA is one of the leading distance learning MBAs in the UK. The syllabus of the graduate entry module is essentially the same as the core course of other UK MBA programmes and competes with full-time and part-time MBAs.

B800 was developed in 1994/95 to provide a fast-track route for graduate entrants and was first presented in 1996. In this development, the computer was seen as an integral learning and communication medium. The collaborative case-study approach to learning only dominates at the five day residential school and thus the investigations centre upon the residential school element of B800. The next section describes the nature and structure of the programme.

As with the Cranfield programmes access to the module was facilitated by the author's relationship with the Open University Business School and the Course Team responsible for developing the module. Once again, while lecturers and course managers were very helpful and supportive, investigations were limited to those which satisfied the Open University's Projects Panel. As B800 was a new module, the students were already being surveyed as part of the Open University quality procedures, so opportunities for additional investigations with these students were limited.

The investigations undertaken were the computer attitude survey and an analysis of the use of a computer supported business simulation. The data collection is described in section 6.2 and the analysis of each investigation in the subsequent sections.

Findings and conclusions from this study are presented in section 6.5. The effectiveness of the study is assessed and findings summarised from two perspectives: the attitudes of the students to computers and their behaviour when using computers. The chapter concludes by highlighting issues in these findings.

6.1 PROGRAMME

The distance learning MBA at the Open University Business School (OUBS) is one of the newer MBAs in the UK but already has more UK students that any other MBA. The MBA was developed in line with other Open University courses as open-access with the normal route to the MBA being through a Professional Certificate and Diploma in Management or equivalent professional qualifications in other disciplines. Following the Diploma route the time taken to complete the MBA is normally four to six years. The first MBA graduates were produced in 1991. Despite its youth, the programme is well-respected; the school was the first wholly distance-learning business school to receive the Higher Education Funding Council rating of excellent and the MBA has been accredited by AMBA (the Association of MBAs).

Typically the current body of MBA students exceeds 4000 (OUBS 1995) with students coming from countries across Europe and parts of Africa and Asia. The Open University requires the Business School to be self-financing so the MBA has to be cash generating.

The MBA consists of two stages; stage one is the core module or alternatively for non-graduate entrants, the Professional Diploma in Management. The entry requirement for the core module in 1996 was an honours degree or equivalent, at least 27 years old and significant experience at middle management level or higher. Stage two consists of a compulsory module on strategic management and three option modules. These modules may be studied at the rate of one or two per year (OUBS 1995 p5).

In 1994 the core module for accelerated route students was redesigned to make it comparable to core courses on other UK MBA programmes. This module, B800 Foundations of Senior Management, was first presented in 1996. It aims to cover management thinking, concepts and techniques in order to 'develop critical, reflective and conceptual skills in analysing management situations' (OUBS 1994). The module also provides an introduction to the Open University's style of Supported Distance Learning and develops the ability to handle case studies.

In the context of the Open University, Supported Distance Learning involves specially written study texts with supplementary readings, audio-visual material or text books developed by a central course team. Presentation of a module is provided through a network of largely part-time tutors based at regional centres. Students have help throughout the course from a tutor, support from their regional centre, residential/day schools and encouragement and support in the formation of student self-help groups. Assessment is via essays or larger projects (TMAs[1]) and/or examination. Tutors are supported by written materials and tutor briefings for new modules. In additional residential schools are normally led by a member of the central academic staff.

In the case of B800 this means 16 study texts of about 45,000 words each, 12 hours of audio/visual materials, 18 hours of face-to-face tutorials (either in the evening or at day schools) in geographically-based groups of about twenty students, 40 hour residential school over 5 days, 8 TMAs and an examination. This involves an estimated 464 hours of study between February and November.

Tutors were selected for their experience in functional specialisms (finance, marketing, people and organisations). Tutors were given training in online computer conferencing

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[1] Tutor Marked Assignment

shortly before the first presentation of B800. In addition there was a briefing weekend provided for tutors prior to the residential schools (see section 6.4).

All MBA students are expected to have a personal computer and modem. B800 expects students 'to use the computer as a tool, as an instructional medium and as a communication device.' (OUBS 1994 p18) For B800 students starting in 1996 the recommended software tool was the most recent version of Microsoft Works for Windows for which an induction pack was available on request. Electronic communication is integral to B800 and aims to 'help prevent isolation and marginalisation of those from particular contexts and allow mutual aid in adapting course ideas to those contexts.' (OUBS 1994 p13) To facilitate this each student is supplied with FirstClass[2] version 2 with an induction course described in section 6.4. Some course material and software is distributed to students via FirstClass. During B800 a large scale computerised collaborative business simulation case, ARKEA, is played starting at the residential school and continuing via FirstClass (see section 6.4).

While there are opportunities for collaboration through tutorials and self-help groups supported by the computer conferencing, the residential school is a period of intensive group work where students work in study groups of five. This group can continue to collaborate on further ARKEA rounds after the residential school. To encourage this subsequent collaboration, an evaluation of the group work formed a part of one of the TMAs in 1996.

The subjects covered in B800 are comparable with other MBA core courses and are similar to those on the Cranfield MBA programmes. Case studies are used throughout the study texts and students are continually encouraged to apply concepts to their own

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[2]FirstClass is a computer conferencing package (SoftArc 1992)

organisation. So using Burgoyne and Stuart's model (see section 2.2) the philosophy of the programme is still social influence but the strategy is less social influence, more information transfer and more pragmatic than the full-time Cranfield programme as a result of the reduced personal contact in the programme.

The case study approach to learning described in chapter 2 only really applies to the two large-scale cases studied at the residential school. The three stage model (figure 2.1) is adopted but this is not made explicit to the students (or in some cases the tutors). As a result of the students' inexperience with the three stage model, they tend not to do enough individual work on the cases prior to the residential school. This is recognised by tutors and allowed for in their facilitation.

6.2 INVESTIGATIONS

Two of the investigations described in 3.3 were undertaken for the B800 programme. The attitude of the students to computers was investigated using the computer attitude survey (3.3.1). Demographic data (sex, first or preferred language, age) was collected about students to assist in the interpretation of their computer attitude scores. The questionnaire was administered during two of the fourteen Residential Schools for B800 in 1996. The questionnaire was distributed at the beginning of the week and residential school tutors asked students to return the questionnaires.

The behaviour of students was studied whilst using a computerised simulation case (ARKEA) (3.3.4). ARKEA, the first major computerised case in a Open University Business School MBA module, was followed throughout its integration into the module, operation and first year review. The case was played at residential schools and subsequently using the electronic conferencing system. The use of the case was reviewed by students, tutors and the course team culminating in a review document produced by the course team (Wheatcroft 1996). B800 was also evaluated as part of

the 1996 courses survey undertaken by the Open University Student Research Centre (SRC 1997).

Key documents were collected together with the review conference containing comments from students, tutors and the course team. These are combined with participatory experiences of tutor training and the operation of ARKEA at two of the residential schools.

The data collected for each investigation is shown in figure 6.1.

Investigation	Questionnaire	Documents collected	Computer conference messages	Participatory observation
Computer attitude survey	✓			
Computerised cases: simulation		✓	✓	✓
Demographics	✓			

Figure 6.1 Data collected for each investigation

Overall the response rate to the questionnaire was good with 122 (54 from the first school, 68 from the second) of the total population of 160 (76%) returning it. Of students responding to the questionnaire 6 (5%) did not indicate their sex and 3 responses were incomplete giving 113 (71%) usable responses. The average age was 37.2 with ages distributed as shown in figure 6.2. This is unlike the distribution of age for the Cranfield programmes; there are no students below 28 (the entry requirement is 27) and the median age is 36.

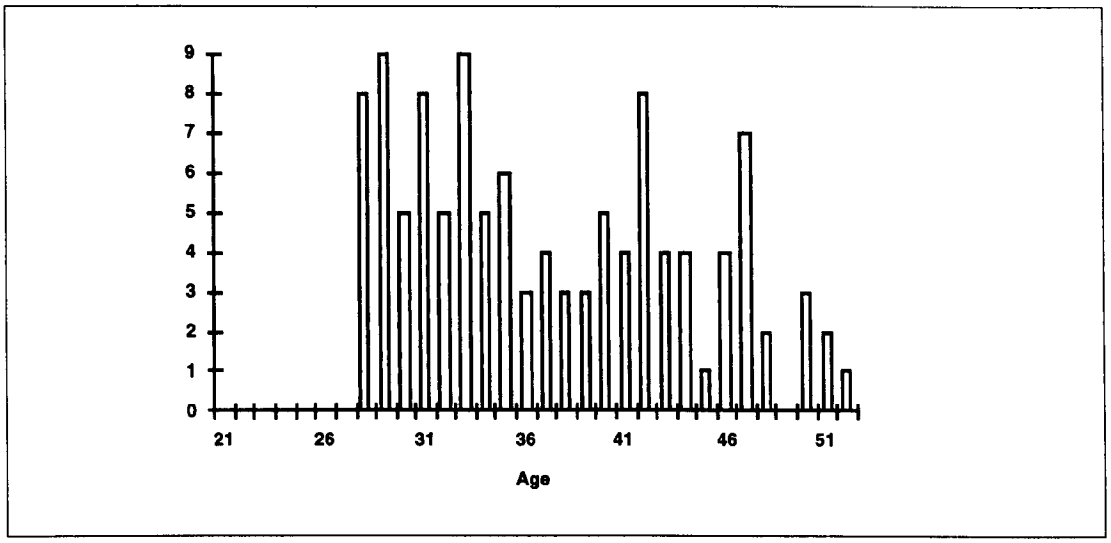

Figure 6.2 Age distribution of respondents, n=113

The next two sections describe the conduct and findings of each of the investigations: computer attitude survey and computerised simulation case .

6.3 COMPUTER ATTITUDE SURVEY

The computer attitude survey establishes the shape of the distribution of attitudes to computers for these students. The survey instrument is described in section 3.3.1.

The survey measures attitude to computers on the sub-scales described in figure 3.2. The averages and variances for the sub-scales and overall scale on a range of 1 (low) to 5 (high) are shown in figures 6.3 and 6.4.

Sub-scale	Mean	Variance
Anxiety	4.15	0.29
Confidence	4.02	0.16
Cognitive	3.76	0.10
Behaviour	3.81	0.26
Liking	4.12	0.36
Use	3.47	0.22
Competence	4.26	0.23
Computer Attitude Scale	**3.94**	**0.11**

Figure 6.3 Results of attitude survey (113 respondents, 24 female)

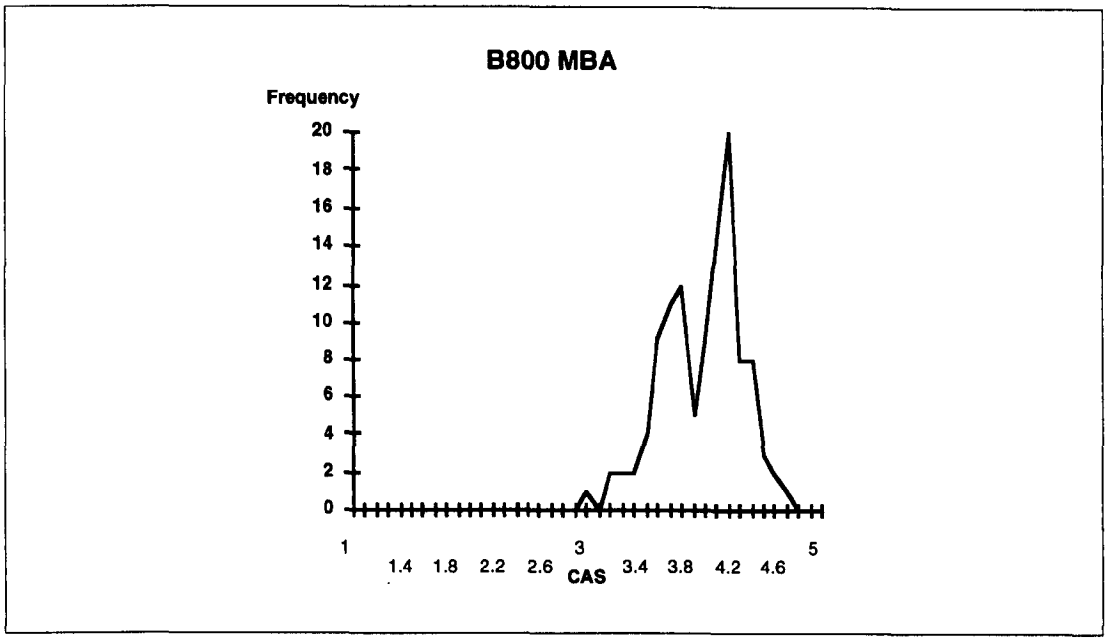

Figure 6.4 Distribution of Computer Attitude Scale, n=113

The figures show values for all respondents. Taken separately the men (89) had a mean CAS of 3.98 (variance 0.10) and the women (24) a mean of 3.77 (0.12). While the difference in the variances is not significant (F=1.1334) the difference in means is significant (t=2.8382, p=0.02). However, the range of the women's scores (3.13 - 4.42) is within the range of the men's scores (2.91 - 4.62).

As with the Cranfield programmes, the notable feature is the high averages across the sub-scales and relatively low variances. Only one respondent had an overall score of less than 3. The attitude survey indicates that the MBA students were generally positive about computers.

Comparison with the results obtained by Robertson et al (1995b) in their study (see figure 6.5) shows a higher attitude scale than the secondary students and parents overall and on each sub-scale except use, but lower than the technical OU students (see 3.3.1 for a description of Robertson's populations). A priori one might have expected an older body of students such as these to be closer to the Parents.

Sub-scale	**Mean**			
	OU students	**This study**	**Secondary teachers**	**Parents**
Anxiety	4.16	4.15	3.64	3.60
Confidence	4.25	4.02	3.80	3.49
Cognitive	3.83	3.76	3.62	3.48
Behaviour	4.02	3.81	3.23	3.63
Liking	4.22	4.12	3.56	3.40
Use	4.02	3.47	3.56	3.84
Competence	4.17	4.26	3.71	3.28
Computer Attitude Scale	**4.07**	**3.94**	**3.63**	**3.51**
Number of respondents	60	113	65	28

Figure 6.5 Comparison with results from pocket book study (Robertson et al 1995)

The attitude survey indicates that the MBA students were generally positive about computers. The narrow band of scales recorded and the shape of the distribution is surprising given the age range.

6.4 COMPUTERISED SIMULATION CASE

The ARKEA computerised simulation case in B800 was a new departure for the Open University Business School in that the case was introduced at the residential school but play continued after the school. This required the students to continue to collaborate using computer conferencing and email. This requirement for students to collaborate outside the residential school was made possible because computer conferencing was regarded as integral to B800. This is discussed in 6.4.1 together with the background to the choice and integration of ARKEA into the module. Section 6.4.2 describes the operation of ARKEA in 1996 and 6.4.3 assesses its operation by analysing the review documents and conference. This analysis is combined with the limited observations obtained from participation.

6.4.1 Integration of a computerised simulation case into B800

B800 was unusual amongst OUBS courses in adopting remote computing as 'integral to the course and not an optional extra' (Paton 1994). The rationale for this revolved around educational and administrative reasons:

> 'Remote computing can reduce the relative isolation associated with distance learning by complementing and building on the interaction that takes place on other occasions (tutorials, day schools, telephone conferences, residential schools).'
>
> 'Skills in remote computing are important in their own right. ... Thus, without remote computing a B800 student will not have the opportunity to learn skills and strategies to extract information from the vast array of data sources available'
>
> 'Remote computing can simplify and reduce costs in course administration'

However there were also marketing concerns:

> 'these developments will not mean that we have caught up with the IT aspects of the sort of programmes against which we would like to compare ourselves, they will at least reduce what has become an unacceptable gap'
>
> 'OUBS is specifying a computer and modem and will face criticism if the latter is not really required.'

It was also preparing the ground for Part II modules; skills taught once in B800 could be assumed in each of the subsequent modules.

To provide remote computing the course team adopted the FirstClass communication and information system. Though mainly seen in the Open University as a computer conferencing system it also provides email and information searching and retrieval services (SoftArc 1992). At the time (1994) it was relatively new and unsupported centrally by the OU but by 1996 it had become the system of choice for student use and was centrally supported at a functional level.

The model of use of remote computing for B800 was computer conferencing. This involved separate induction processes for tutors and students based on Salmon's model of skill acquisition and socialisation (Salmon and Giles 1996) and an emphasis on tutor conferences. Because of the relative inexperience of the tutor body as a whole, tutors were grouped into fours (two specialising in finance and marketing and two in people and organisations) to jointly moderate a single tutor conference. It was also felt that this would give enough students per conference (4x 20) to provide a critical mass even if usage followed the Open University pattern of one third active, one third passive (or 'lurking') and one third inactive (Mason 1989 p124).

The B800 Blueprint (Paton 1994) identified collaboration and team work as an objective of 'remote educational' computer support. However it acknowledged the

conflict between providing a common purpose to achieve successful computer supported collaboration and individual assessment. It was suggested a teamwork exercise such as a computerised simulation case would avoid the conflict.

Investigation of this for the course team (Oram 1994) concluded that

> 'Business games are used in comparable programmes as a means of promoting team work, integrating functional skills and providing some experience of group decision making'
>
> 'A business game run in this way could also be the basis for a TMA of the individual's reflections on group decision making.'

The OUBS has some experience of using business simulations at residential schools but the opportunities for learning, particularly about group processes, are limited by the short duration of the schools. B800 provided the opportunity for using a longer simulation starting at residential school and continuing remotely by email, computer conferencing and remote submission of decisions.

The course team decided to adopt a computerised business simulation as one of two large collaborative cases which form the core of the B800 residential school. A demonstration version of the simulation program was distributed before the residential school as part of the student's Residential School Notes. The other case ('Bad Apple') was a conventional paper case that had been used in various ways in other OUBS modules. The background reading for the case was also part of the student's Residential School Notes; an additional dossier of papers was provided at the school.

6.4.2 Operation of ARKEA in B800 in 1996

The computerised simulation case adopted was 'ARKEA New' a variation developed for the Open University of 'ARKEA Europe'. This is a competitive business simulation or

business game developed by M&U Management Utilities of Milan and marketed in the UK by Cranfield School of Management. The simulation is of a vertically integrated manufacturer and retailer of fabrics, furnishings and fittings. The students enter the simulation in the third period, that is they have to make decisions about a going concern. There are four, initially identical, companies in each 'world' and four worlds at each school. This four by four grouping meant that it could be arranged that competing study groups in the computerised case were not working together in the 'class' (four study groups) sessions on the paper case.

Study groups have to make four decisions during the school, one practice decision and three real decisions. Each decision is for a six month period. The times allowed for decision making and post decision reflection on strategy and group process are shown in figure 6.6. In terms of the three stage model, the stage 1 occurs before the school and between decisions depending upon the role the student adopts. The stage 2 is the decision making and the stage 3 occurs after each decision when the four study groups meet as a class.

The data available to inform decision making is: a 'Management Report' on the existing position of their company in the market; information about future market conditions published in a 'Journal'; and information about the consequences of their decisions if their competitor make no changes. The last is provided by the group's version of the simulation program and is presented in the form of a management information system; this is also used to record the group's decisions.

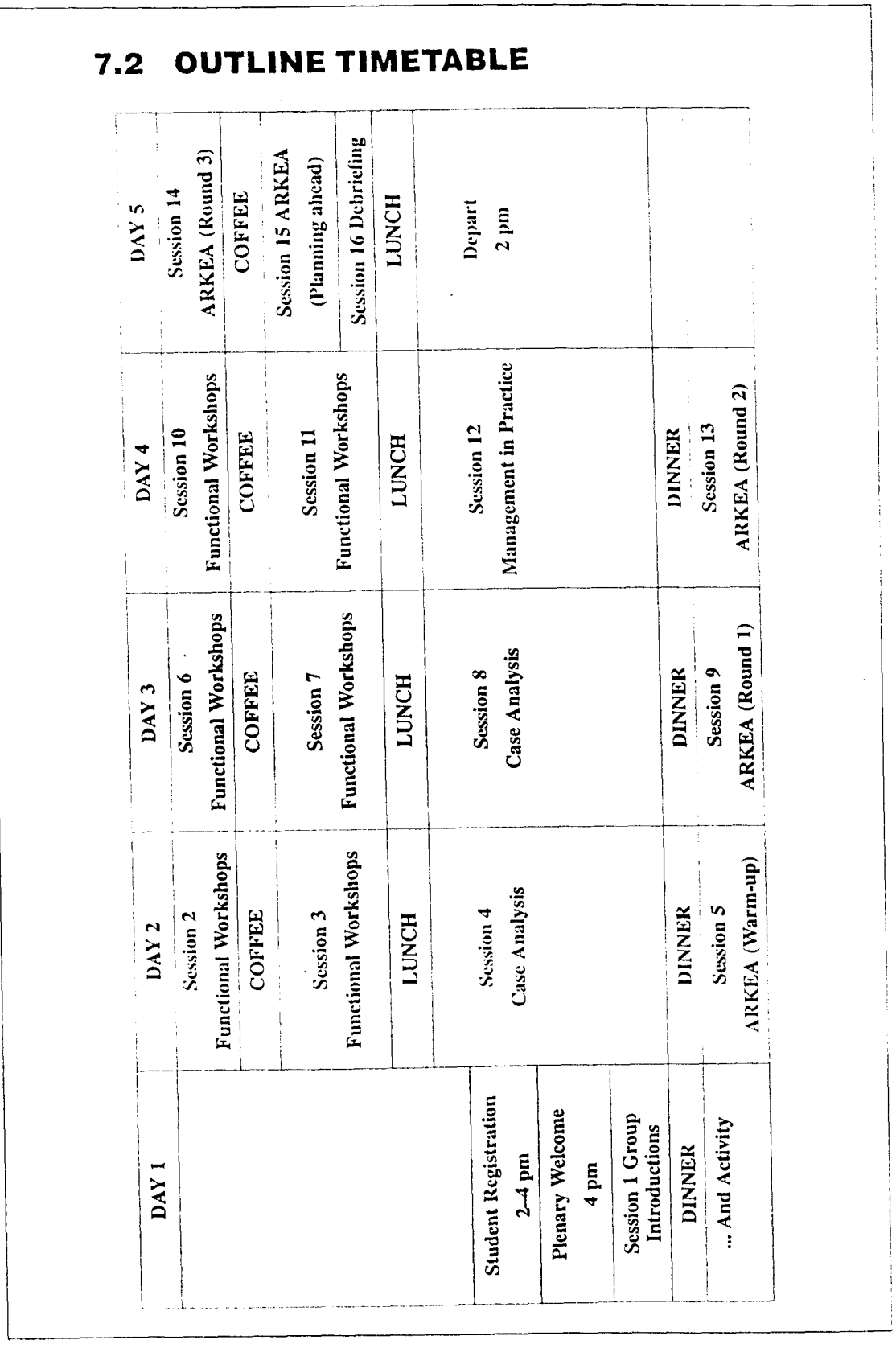

Figure 6.6 Timetable for B800 Residential Schools

The simulation is fairly complicated with some twenty five information screens any one line of which may expand into a further screen to show a breakdown across the three product lines. The format of the screens is character (DOS) based because of the age of the product. This maturity of the simulation and its ability to be 'read' by programs that 'read' or magnify screens for those with restricted vision were seen as benefits by the course team. A copy of the simulation program was sent to each student before the school so that they could become familiar with it but few chose to do so.

Decisions were made by entering the values into the group's simulation program which recorded them on diskette. The diskette was then given to the ARKEA tutor before the announced deadline. The decisions were processed by a tutor's version of the simulation program and the diskette with the new position plus the Management Report and Journal returned to the study group. The ARKEA tutors were also available during the decision making period to advise on problems with using the simulation program. The other tutors at the school should also have been available as 'consultants' to advise on general business matters.

All tutors had had the opportunity for some experience of the simulation at a pre-residential school Tutor Briefing weekend. In addition, the ARKEA tutors had had specialised training at Cranfield.

Following the residential schools a combination of FirstClass email and conferences was available for the study groups to make three further decisions. Schools taking place at roughly the same time were grouped into streams with common decision deadlines allowing 1-2 weeks for a decision. For the last stream the last decision deadline was close to the examination. A review conference after the final round allowed for some reflection on strategy. Five percent of the subsequent TMA was devoted to the group's performance 'during and after the Residential School'. The participation levels in post-residential school rounds are shown in figure 6.7.

Site	Week	Rounds 4,5 &6	Round 6 only
Herriot Watt	20-24July	44%	38%
	25-29July	52%	38%
	30Jul-3Aug	60%	44%
Peterborough	21-25July	60%	50%
	26-30July	79%	75%
	31Jul-4Aug	44%	31%
Dublin	3-7Aug	40%	31%
	8-12Aug	52%	69%
Dunchurch	29Jul-1Aug	73%	69%
	10-14Aug	60%	44%
	15-19Aug	52%	38%
	20-24Aug	35%	25%
Leiden	31Jul-4Aug	42%	33%
	17-21Aug	60%	56%
Overall		**54%**	**46%**

Figure 6.7 1996 ARKEA post-residential school submissions

6.4.3 Analysis

The main method of data collection for this investigation was by participation in the development and delivery of ARKEA in 1996. This included being actively involved in the Tutor Briefings and the training for ARKEA tutors, being an ARKEA tutor at two schools (Dunchurch) and attending the ARKEA and B800 all day evaluation meetings. Throughout this participation a wide range of documents were collected covering design, delivery and evaluation of the use of ARKEA in B800 in 1996. Much of the analysis in this section depends upon this participation and in some cases reflects thinking, attitudes and experiences which were not written down.

In addition to observation and informal conversations with students at the two residential schools attended, their views are also available from the FirstClass conference where they were asked to review their strategy in ARKEA. A snapshot of the conference, taken as a backup, was used for this analysis because the original conference was deleted. This means the messages are available for analysis but the history is not so it is not possible to determine how many read each message. Unfortunately only 9 students (out of 1200) contributed to the conference as shown in figure 6.8 although some messages in the conference indicate there was probably additional email correspondence.

			Thread contributions			
		No. of messages	**Team Strategy**	**Team working and specialisation**	**Retail/ wholesale**	**Comments and feedback**
DS	Tutor	3	Initiated	1		Initiated
JS		1	1			
WW		1	1			
DB		1	1			
GL	Tutor	2	1			1
RP	Tutor	1		Initiated		
PH		5		5		
HL		1		1		
AR		2		2		
RJ	Tutor ?	1		1		
PD		1		1		
EM		1			Initiated	
CA		1				1

Figure 6.8 Participation in ARKEA Review conference threads

The students' view is also reflected in the Courses Survey 1996 (SRC 1997) which looked at inter alia B800, obtained information about computer use and asked for comments on the course. Of the 294 B800 students sent the questionnaire 173 (58.8%) responded. 99.4% of B800 respondents said they used a computer for study purposes and 30% purchased a computer to start the course. The one paragraph summary of open-ended comments about B800 noted 'FirstClass had some problems'; no other reference was made to computers.

The data was analysed by open coding a summary of the ARKEA review day (Wheatcroft 1996), a submission to the B800 review day by the course team chair (Paton 1996) and the review conference. This provided a structure for the analysis which was then expanded by considering the other evidence. Of interest to this research is the use of the computerised simulation case and the computer support via FirstClass of remote play following the residential schools. The evaluation by the course team focused largely on issues concerning the delivery of ARKEA and as this will have affected the use of ARKEA it is discussed first. In the following discussion quotes are attributed where possible to documents or conference messages by initials.

- **Analysis of the delivery**

ARKEA was a new case and a new innovation being run during the first delivery of a new module so it is hardly surprising that there were 'hardware, software and wetware' problems.

Hardware involved two PCs at each residential school to run the simulation and a PC for each student group playing the game. At the residential school it was largely the responsibility of tutors specially trained in ARKEA to look after the hardware coping with such student problems as 'smoke coming out of the back of the monitor'. There were relatively few hardware problems at residential schools and the case was successfully run at all the schools.

Following the residential schools, the disks containing the current rounds were taken back to the Open University so that subsequent rounds could be run with students submitting results via FirstClass. Instead of the students submitting their decisions by taking a disk to the ARKEA tutor as at residential school, they submitted a message over FirstClass that was processed automatically. There were various problems at the interface between the residential school and remote operation of the game, in particular getting each student correctly subscribed to the FirstClass conference for their world. Overall the hardware performed well and submission of decisions by FirstClass was effective.

The ARKEA software was adapted for the Open University and delays in contracts meant that the software arrived late. As a consequence there were printing problems which necessitated some students having to download replacement versions and a number of other small errors emerged during the operation of the game. The Open University's central computing service wrote the program to interface ARKEA to FirstClass and monitored the operation of the game following the residential schools.

The main problem with the software was that it was DOS based which meant ARKEA tutors had to be familiar with DOS and it had an out-dated image. Tutors at the ARKEA Review meeting in October 1996 felt this affected student attitudes:

> *'the view was that it was out dated because it was DOS .. and that was that'*
>
> *'the perception that the students had was that it was yesterday's technology'*

There was a similar comment expressed by a student in the review conference :

> *'I would also say that any parent who has watched their child playing SIMCITY would have felt that Arkea was incredibly unsophisticated with around a 1985 user interface.' AR*

However this was challenged by a visually disabled user later the same day:

'Please don't knock "1985" interfaces, [student's name] - some of us can read them who don't have a hope with some of the "modern" ones.' RJ

As a consequence a Windows version is being developed but it is recognised that the only real benefit is to allow Windows to take care of the printing (Wheatcroft 1996).

Although there were some problems with hardware and software, the support for ARKEA provided by those at the residential school resulted in comments such as:

'The administrivia and organising was such a shambles' PH

A number of people were responsible for the operation of ARKEA at the residential schools but those principally involved were the ARKEA tutors and the Consultant tutors. The intention was that the ARKEA tutors would be trained to handle the technical aspects of ARKEA including the setup and operation of the simulation. The Consultant tutors were supposed to facilitate the students' work on ARKEA by providing managerial advice during decision making and leading discussion on both process and strategy during the review sessions. Almost all the Consultant tutors attended a two day briefing on the residential school and had an opportunity to play a round of the game. There were two ARKEA tutors, six Consultant tutors and a Course Director at each school.

The role of Consultant tutor was problematic at most schools so that ARKEA tutors ended up covering both roles leading to comments such as:

'There seemed to be no tutor with any concept about how to handle hardware problems and little articulation of how the environment worked and what sorts of strategy might be pursued.' AR

There seem to have been problems caused by a 'unfamiliarity with Arkea as a game', 'uncertainty about what was the role' and a lack of knowledge about 'its use as a

pedagogic medium' (Wheatcroft 1996). In consequence the review sessions were poorly handled or not handled at all. This was in contrast to the paper case, Bad Apple, which was run at the same schools by the same tutors with relatively few hiccups.

It would seem that there are a number of reasons for the problems faced by the Consultant tutors: the subject of the case was new to all of them (where Bad Apple would have been familiar to some tutors); their lack of computer skills made them unsure how to handle the case (even though there were the ARKEA tutors on hand to handle technical questions) and meant that maybe they had not used the disks sent out before the school; and, the three stage model was not made explicit to them so that they viewed the review sessions as optional.

- **Analysis of the simulation**

Students were divided into groups of five in such a way that those from the same company were not together but with no attempt to provide a mix of experience. The students had mixed success in forming groups and some Consultant tutors were not aware of the importance of facilitating group formation.

> *'The follow-up rounds, away from the summer school have shown how important it is that the momentum of the project is kept going. It would have been very easy for the whole thing to collapse without a commitment from each member and therefore, the engendering of team spirit is very important.' DB*

> *'Failing teams useually have problems with their objective/goals, we're told, and here we certainly felt that the goal of the team wasn't valued/valuable in the wider context of the course and the examination.' PH*

One of the rationales for including ARKEA in B800 was to integrate functional specialisms and hence lead into strategy with a view to it being used as a bridge to the strategy module (Paton 1996). The size of the simulation tended to encourage students

to take a strategic approach although some students very successfully used the software to support a more mechanistic approach:

> *'One thing that we found was that one way to maximize your result was to systematically amend each entry, item by item, and see what happens to your profit, R.O.S. ,share price and projected market share.' DB*

One tutor noticed that students did not report (in their TMAs) adopting functional roles during the residential school despite the quantity of material (RP). Reasons put forward for this were:

> *'We retained a democratic structure throughout - partly because with only one computer per team at the summer school, we couldn't conceive how to devolve responsibilities.' AR*

> *'groups not breaking up much seems to mirror what tended to happen at my summer schools. I think we all wanted to learn as much as we could so we wanted to see everything.' RJ*

There were mixed opinions about the success of ARKEA as a learning experience. Wheatcroft (1996 p1) reports that 'participants viewed the simulation favourably but not without pertinent criticisms' and implies that the criticisms were to do with failings in the technical and operational side of ARKEA. He also implies that the full learning potential of ARKEA was not captured because of the students' inability to use the simulation software.

The inherent competitive nature of ARKEA was at odds with the Open University ethos according to some tutors and at some schools the profits at the end of each round were not 'published' for this reason.

The focus of the staff evaluation seems to be on these technical and operational issues rather than on pedagogic criteria. The summary of ARKEA review day concludes:

'Overall, the conclusion of the meeting was that ARKEA was a very useful part of the Residential School programme, not least because it gave students something exciting and energising to do in the evening "slot" when other programme items might have difficulty in generating participation.' (Wheatcroft 1996 p3)

Groups that did not gel tended not to value the exercise and to lack the motivation necessary to continue to play after the residential school. Contrast the following comments from the conference

'I was not aware of anyone on my Summer School who had managed to make it to above the age of 27, convinced the OU that they had managerial experience and not worked in a team at work. The theories in the course material gave those who have not covered team dynamics in previous company training programmes the chance to reflect on their experience - in the same way that the workbooks do for every other aspect of managerial experience. It seems hard to justify (to me) to spend almost half of the summer school on one small aspect of the course. It smacks of low expectations and OU groupthink that team working is the be all and end all

ARKEA may have been fun or not, productive or a failure, but I think the OU's expectations of learning from it are far too high because their expectations of people are far too low. Many people in my summer school group got far more out of the bad apple case study - at least there was an opportunity to do some deeper Finance, Marketing and Organisations work, whilst working in a team.' CA

with

'We were a cohesive team and enjoyed both continuing the game and continuing our learning about team dynamics.' HL

'The entire experience has been invaluable in teaching that there is a great inter-relation between departments and functions and that only by ensuring that structures are in place which encourage communication, collaboration and co-

operation, whilst having clear strategies and measurable goals with strict financial control, will a team be successful in it's efforts.' DB

Despite the old fashioned look of the simulation it provides extensive options for drill down; the written report at the end of each round is supported by functional breakdowns with more detailed product breakdowns available were relevant. The software also provides a what-if capability which supported the mechanistic student groups and was extensively used particularly in the early rounds before the effects of competition were felt. The software has facilities which even the more capable students did not use initially. One area where the software was limited was that students seemed to have difficulty determining what was happening to their competitors.

Compared with the tutor view, the student view of ARKEA is more diverse: those that succeeded felt that they learnt a lot about team dynamics and the integration of functional specialisms whilst those that did not succeed felt it was too simple. The software was sufficiently sophisticated to satisfy the more capable students and did not seem to daunt the less able at least at the residential school. The software was much more an issue for tutors than it was for students.

- **Analysis of the computer support of remote play**

The remote operation of ARKEA following the residential schools used FirstClass as a mechanism for groups to transmit their decisions and receive their results. The submission rates shown in figure 6.7 vary depending on the nearness to the examination and the technical success of ARKEA at each residential school but are high for what was essentially an optional activity.

It was not intended that the group work (stage 2) of remote play should be supported by FirstClass conferences but rather by email because of the need for confidentiality. It

was not possible to monitor email but from the review conference it seems students used a variety of communication media:

> *'Since the summer school, 3 of the team have not had access to a computer so the operation of the game and our group decision making has become much more difficult. I have been making the detailed investigations and decisions then faxing/phoning the other members to get their approval.' DB*

> *'At the point that happened, we found conferencing insufficient and had additional telephone conversations. I think this is unsurprising -e-mail is quite good for discussing hard issues but is pretty limited for handling soft issues and messes.' AR*

It is not clear whether the review conference was intended by the course team to provide the stage 3 review of the ARKEA case as their messages seem to reflect interest in both student decision making strategies and feedback on the operation of the course. Student reflection on the team dynamics element of ARKEA was included in the final TMA but it was not possible to investigate student responses to this.

As only 9 out of 1200 students contributed to the conference it was not an adequate provision for stage 3 even allowing for lurkers. The poor contribution may have been because students were put off by the mixed messages about the conference purpose , did not consider it to be part of the module, and the imminence of the exam. However, the numbers of students accessing FirstClass may also have been one of the problems. The ARKEA results only depend on one student in the group using FirstClass and there were certainly students who were not using their computers by this stage in the module (one student at residential school commented that he was 'required to buy a computer but [it was] not used').

One of the nine conference contributions commented on the lack of feedback:

'On that level, the final result was neither here nor there, but if we had not made a profit by the end of the game, given the lack of formal feedback, we would have been left wondering where we had gone wrong.' HL

The quality of contributions to the conference were good with most students reflecting on their strategy although only one referred to underlying theory. However the dialogue in the conference was about the operation of ARKEA rather a discussion on strategy.

The remote operation of ARKEA was successful in that over half the groups (54% see figure 6.7) submitted decisions after the residential school. However as with the residential school the case lacked a satisfactory stage 3.

6.4.4 Summary

The computerised simulation case, ARKEA, with elements of residential school and remote play was a new innovation for the Open University Business School. Involving 14 residential schools in the UK, Ireland and the Netherlands, 1200 students and over 80 tutors using a new simulation with mechanisms for remote submission by FirstClass, it was obviously going to be a challenging operational experience for the first presentation of a new module. There were some operational problems but the simulation was run at all residential schools and over half the remote decisions were successfully submitted. The most serious problems arose through a lack of understanding of the Consultant tutors leading to an absence of stage 3 for many students.

Views on the simulation as a learning experience varied but it was clearly effective at highlighting team dynamics issues although as with other forms of experiential learning this was not recognised by all students at the time. Realisation of the other learning goal of encouraging the students to think strategically depended on successful group formation.

The computer support of the simulation was generally successful from a student perspective although it seemed to dominate the case for tutors. The software improved efficiency by allowing 6 rounds to be played where only about 3 would have been possible without computer support. The software increased the effectiveness of many students by allowing them to explore alternatives in a very short timescale.

This investigation also concerned computer conferencing as B800 relied upon the use of FirstClass for communication between central administration and students and tutors. FirstClass was successfully used by students to submit and receive their decisions in remote play even though the training in FirstClass occurred six months earlier. FirstClass was not a successful medium for a stage 3 discussion on the strategies used in ARKEA with only 9 out of 1200 students contributing.

6.5 FINDINGS AND CONCLUSIONS

This chapter has described the complementary research case study undertaken on the 1996 presentation of the core module, B800, of the Open University distance learning MBA programme. The research involved two investigations into the students' attitude and behaviour when using computers in collaborative case based learning. This section brings together the findings from those investigations to discuss what has been learnt about computer support of collaborative case based learning by these MBA students.

Section 6.5.1 discusses the usefulness of this research case study in addressing the research agenda and assesses the conduct of the investigations. The next two sections consider the attitudes and behaviour of the MBA students to computers. The final section (6.5.4) considers the implications of these findings.

6.5.1 The study

The complementary study of the Open University B800 module provided the opportunity to study a different type of student on a different MBA and thus establish whether the Cranfield students were unusual amongst MBA students in their attitudes to computers. The Open University was an appropriate choice because of its experience with distance learning and the reputation of its MBA. Moreover B800 was designed to be comparable with core modules on other generalist MBA programmes.

In addition, the Cranfield MBAs studied in chapters 4 and 5 did not provide an opportunity to study the use of a computerised simulation case. A computerised simulation case played face-to-face and remotely was introduced into the OUBS MBA with B800 in 1996. Studying a new module had the advantage of allowing participation in the design and evaluation of the case but inevitably the operation of the case was affected by its newness.

The OUBS uses illustrative cases throughout the MBA and uses collaborative cases at residential schools. For B800 the major aim of the two residential school cases is to integrate the functional specialisms and allow the practical elements of team working to be studied. The three stage model is adopted by the course team for the study of cases at residential school but is not made explicit to students or residential school tutors.

In terms of the Laurillard model, the simulation software provides the interaction between the student and the teacher constructed world with the student as 'researcher' in 'discovery' mode (Laurillard 1994). After the school, computer conferencing is used to support collaboration at a distance . The Laurillard model views this as a 'discussion' with student and teacher as 'negotiators'; the extended model (2.2.1) views it as discussion between students during stage 2. In the extended model, the teacher reflections leading to adaptations of the teacher constructed world take place in stage

3. At residential school this was a tutor led review and afterwards a tutor moderated review conference. Unlike paper cases the multiple rounds of the simulation case mean that the cycle of the extended model is repeated so the adaptations might be expected to be more visible.

My relationship with the Open University gave me access to the course team and the student body. However my lack of experience as either an Open University student or tutor constrained my understanding of the culture. The adoption by B800 of reducing course team meetings in preference to block meetings made it more difficult to follow the development of the module and in any case this research began in the later stages of the development. There were also additional constraints on my contact with students imposed by the University because this was a new module.

Although B800 involved 14 near identical residential schools it was not possible to negotiate a quasi experiment running the simulation case without the computer support so the inherent behaviour of the students had to be observed. Observation was limited at residential school by my role as an ARKEA tutor and there was no time formally to interview students or to distribute an additional questionnaire regarding the simulation case. In remote play access was obtained to the world conferences but as expected these did not contain group discussions because of confidentiality considerations. It was not possible to gain access to email messages. A questionnaire to students after remote play was not feasible because of the proximity of the exam and University constraints.

6.5.2 Attitudes of MBA students

The computer attitude survey developed by Robertson (3.3.1) was completed by 113 of the 160 students at 2 of the 14 residential schools. The results (6.3) show a group of students with a high computer attitude score compared with other non-technical audiences. With this population, where there was a relatively flat age distribution

between 27 and late 40s, a distribution reflecting age might have been expected (over half the students would have completed their full-time education to first degree level when the IBM PC was launched). However, age was not a significant factor in the distribution of scores. The high mean score and low variance indicate a population that regards itself as competent and enthusiastic computer users.

6.5.3 Behaviour of MBA students

The behaviour of the students in using a computerised business simulation case, ARKEA, was investigated. The simulation was an integrative case played by students at residential school and subsequently remotely. Stage 1 occurred before the residential school with students being sent briefing papers and a disk containing the software supporting the simulation. At residential school stages 2 and 3 were repeated with three rounds being played. During stage 2 students used a copy of the simulation software to read their position, perform what-if analysis and prepare their submission. There were two stage 3 reflective sessions in the timetable, one focusing on group processes and one on strategy. In practice these reflection sessions either did not happen or were considerably curtailed.

Following the residential school the student groups had the option of continuing the game for three more rounds using FirstClass to submit and receive results. Collaboration during this time was supported by email and other non-electronic means. Stage 3 was provided via a review conference. Although the ARKEA was only assessed via a small part of a TMA, over half the remote rounds were played but only 9 (out of 1200) students contributed to the review conference.

The main data collection method was by participant observation during the development of the residential school, as ARKEA tutor at two residential schools and during the end of module evaluation meetings. Unfortunately observation of students at residential school was limited by my role. A copy of the review conference was taken

but it was not possible to access student email or to determine the lurkers on the conference. Analysis of the investigation was based upon open coding key documents and the review conference supported by observation and discussion with the course team and tutors.

Given the problems of introducing a computerised simulation case to be run face-to-face and remotely for 1200 students and 80 tutors ARKEA was a success despite some technical and administrative problems. Although the simulation software had to be used to see detailed results before preparing a submission and remote rounds had to be submitted using FirstClass, only one student in each group had to use the software. Consequently the remote submission rates imply only about 120 active computer users. Nevertheless use of computers for the simulation and submission of remote results improved the efficiency for all students by allowing more rounds to be played than would have been possible for a manually operated simulation.

Both cases at the residential school aimed to integrate the functional material taught in the module and to provide a practical exploration of group dynamics. The reasons for using a computerised simulation were partially to ensure that computers were used within the programme and to provide an opportunity for students to use remote computing for collaboration. In practice the tutors' lack of understanding of the software meant that pedagogic aims were neglected by the tutors and the simulation became perhaps no more than a stimulating evening exercise.

In contrast the student view of the computerised simulation case depended upon whether their group successfully formed and in this respect the use of the computer seemed to accentuate the importance of group dynamics. Those students whose groups worked seemed to learn from ARKEA and for some their effectiveness was increased by exploiting the software to undertake what-if analysis.

6.5.4 Conclusions

Despite the older population on the Open University MBA the attitude scores are still high demonstrating a high level of confidence in computer use by students. It could be argued that this confidence was reflected in their behaviour with the computerised simulation case and the high level of essentially optional play after the residential school. However in practice only one student in each group of 5 needed to use the computer and this use was not necessarily very sophisticated. The use of the computer seemed to have a much more marked effect on the tutors, leaving them unsure of their role.

The investigation shows that it is technically possible to run a large computerised simulation involving remote submission. The use of the computer increases efficiency by allowing students to play more rounds in the same time. There were some concerns amongst the course team that the simulation was unnecessarily complex but in 1996 some students did use the facilities in the software to improve their effectiveness and by the following presentation some students reached the limits of the model underlying the software (Oram 1997).

This research case study demonstrates the relevance of the extensions to the Laurillard model (see 2.2.1) because a missing component leads to a loss of effectiveness. The extended model requires, in stage 3, teacher reflections leading to adaptations of the teacher constructed world; these were not present because of tutor uncertainties about both their role and the ARKEA software.

7 Conclusions

This chapter concludes the thesis by discussing the research undertaken, the findings of the research and the implications for MBA programmes and further research in this area.

The research agenda established in chapter 2 led to the adoption of an exploratory research paradigm based on the study of three research cases as described in chapter 3. The following three chapters described the investigations undertaken in each of these research cases. Section 7.1 evaluates the extent to which these investigations met the requirements of the research agenda - their utility (see section 3.1).

The findings from the research polarise into the differences between the MBA students' attitudes to computers and their behaviour when using computers to support collaborative case based learning. Taking these two perspectives, sections 7.2 and 7.3 discuss the findings from each investigation highlighting the similarities and differences between the research cases. The goodness (see section 3.1) of each investigation is critiqued.

Six propositions arising from the investigations are discussed in section 7.4. Considerations of goodness and utility are used to indicate the strength of each proposition and identify the need for further work.

The difference between the attitude and behaviour of MBA students when using computers to support collaborative case based learning identified by this research has profound implications for the design and implementation of case based MBA programmes and important implications for the use of cases in other MBA programmes.

These are discussed in section 7.5 together with opportunities for further research in this area.

7.1 RESEARCH CASE STUDIES

The case based method of teaching is widely used in UK MBA programmes and represents a learning approach which is peculiar to management education because it builds upon the expertise of the students by involving them as experts in their own right (chapter 2). There is considerable potential for computer support of case based collaborative learning but to date there has been limited research on how the overall package of computer usage supports collaborative case based learning. Given the unusual nature of the learning model that underpins case based learning, research into computer support in other forms of education has limited applicability (chapter 2). The design of the substance of cases is largely based on oral traditions and as such their enhancement via computerisation has been little studied (Oram 1996a).

7.1.1 Requirements of the research agenda

This research set out to understand computer support of collaborative case based learning by MBA students focusing on programmes where the case method is dominant at the strategic as well as the tactical level. Computer support of the process of case based learning can be provided by analysis, collaboration and meeting support tools and of the substance by computerised cases (chapter 2). The lack of underlying integrated theories justified the use of an exploratory research paradigm based on research case studies (chapter 3). Three research case studies were used to enable computer support of collaborative case based learning to be studied for full-time, part-time and distance learning students following similar curricula.

The use of exploratory research implies a holistic-inductive paradigm rather than a hypothetico-deductive paradigm and led to the propositions discussed in the subsequent sections of this chapter. Within this paradigm, quality is judged in terms of goodness and utility. For this research to satisfy goodness criteria the results need to be consistent within the world views of the academic staff and students on the programmes studied and credible in the context of the publicly shared reality of directors and tutors of case study based MBA programmes. The research satisfies the utility criteria if the results can be extended to propositions covering other UK case based MBA programmes since it is intended that the findings will influence the design and provision of such programmes (chapter 3).

7.1.2 Breadth of the investigations

Five investigations were conducted in research case studies of the Cranfield full-time and part-time and Open University distance learning MBA programmes to explore the attitudes of the students to computers and their use of the different types of computer support (chapter 3).

The investigations were designed using the three stage model of case based collaborative learning to identify when computer support might reasonably be used. The process of case based learning embodied in the three stage model uses students as experts and required an extension to established learning models. Chapter 2 proposes an extension to Laurillard's conversational framework in order to recognise the dual role of MBA students as both learners and experts. This extended model describes the interactions that occur in case based learning. Where relevant, data collection was based on the three stage model and the need to identify outcomes in terms of effectiveness and efficiency of the learning process.

Two investigations considered the students' attitudes and opinions about computer support: the computer attitude survey and the computer support of case based learning

questionnaire. The computer attitude survey measured the students' attitude to computers in general before they started the collaborative case based element of the programme. The questionnaire explicitly asked students to comment on computer support during each of the stages of case based learning both before and after the collaborative case based element of the programme. The computer attitude survey was undertaken for all three research cases and the questionnaire for both Cranfield MBAs.

The breadth of coverage of the attitude investigations was not matched in the behaviour investigations. Initially it was not perceived as important to distinguish between attitude and behaviour and the first behaviour study was designed as a quasi experiment to investigate the effect of the introduction of computerisation of a case. However this investigation revealed an important difference between the competence of the students as indicated by the results of the computer attitude survey and their use of the computerised case.

The computerised case investigation included the students' use of analytic and, to a limited degree, meeting support tools as they worked on the case. It did not include computer mediated collaboration or computerised simulation Consequently two additional investigations were designed to examine the students' behaviour when using these tools. Each of the three behaviour investigations were undertaken in only one research case study because of practical limitations.

All the investigations required careful negotiation with academic staff to set up but data collection in the attitude investigations was relatively straightforward with good response rates. Data collection in the behaviour investigations was more difficult. There were practical difficulties in collecting qualitative data when the timetables of MBA students are very busy or the students are physically dispersed as in the Cranfield part-time and Open University distance learning programmes. At Cranfield there was the restraint that no student should be able to claim that the research had

interfered with their study. This constraint and the scientific ethos of the institution made it difficult negotiating access to collect qualitative data (by for example interviewing students).

The investigations allowed the attitudes of MBA students to computers to be studied on all three programmes and their views on computer support during case based learning to be studied on the two Cranfield MBA programmes. Comparisons of the results of the attitude investigations are given in section 7.2. The three behaviour investigations allowed the use of the four types of computer support to be studied but only in the context of individual research case studies and these investigations were subject to greater problems of data collection. Results from the behaviour investigations are discussed in section 7.3. In summary the investigations covered the attitudes of MBA students to computer support of collaborative case based learning in the three study modes but were more limited in the coverage of the students' behaviour.

7.1.3 Utility of the research case studies

The three research case studies were selected on the basis of their reputation, delivery mode, use of collaborative case based learning, curriculum content, extent of computer support and my relationship with the institution. Chapters 4, 5 and 6 describe the MBA programmes for each of the research case studies but to allow the reader to judge the utility of the results a summary of characteristics is presented here.

Cranfield School of Management has one of the oldest and largest full-time MBA programmes (149 students in 1995/96 cohort studied) with a sizeable part-time programme (61 students on the unusually low 1996/97 cohort studied). The Open University Business School (OUBS) distance learning MBA is relatively new but is one of the largest (about 1200 students on the 1996 B800 presentation studied) and is already well-respected.

The case method is used in some form or other in most UK taught MBAs and the European Case Clearing House publishes advice on the use of cases and the three stage model. At Cranfield the collaborative case method is the dominant strategy for the core course and the three stage model is made explicit. At OUBS case studies are extensively used but the strategy is less social influence and more pragmatic than at Cranfield. Reflecting the distance learning mode, collaboration in the case method only occurs in B800 for the cases studied at residential school. The three stage model is used but is not made explicit to students or tutors. The reliance in the case based method on student expertise is reflected in the entry requirement requiring management experience (three years for Cranfield and five years for OUBS).

Cranfield has a common core for both full-time and part-time programmes which is typical of the compulsory material covered in most case study based UK MBA programmes. The subjects covered in B800 are comparable.

In the full-time programme at Cranfield computer use is established but is regarded as a tool. Students are not required to purchase a computer although most students do have access to a computer. In the part-time Cranfield programme and OUBS B800 module electronic communication is integral to the programme with CMC used to replicate face to face processes. Students are required to purchase a computer and modem. In both programmes some material is distributed electronically although this delivery method is more extensively used at OUBS. Computerised cases are not used on the Cranfield core courses but OUBS uses the simulation case described in chapter 6.

As a former lecturer on full-time and part-time Cranfield MBA programmes and a student on the part-time programme I was ideally placed to undertake a research case study on the Cranfield MBA. I was attuned to the world-views of faculty and students. As a tutor and adviser to the course team for the OUBS B800 module I had empathy

with the world-view of central and tutorial staff but a very limited understanding of what it means to be a student on B800.

In considering the utility of the research the characteristics of the student populations investigated should be noted. Figure 7.1 shows the age distributions for those returning the computer attitude survey. These are typical for MBA students; Slack (1995) reports an average age on full-time programmes of 27 and on part-time programmes of 35. Cranfield recruits a significant proportion of overseas students on to its full-time programme but fewer on the part-time (in the survey there were 15 students on the full-time programme and 0 on the part-time programme for whom English was not a first language). OUBS students come from Europe, Asia and Africa in addition to the UK but the residential schools observed were held in the UK (English was not the first language for 3 of the students surveyed). The proportion of women on many MBA programmes is small; the proportion of women returning the survey for each research case was full-time 11%, part-time 17%, B800 21%.

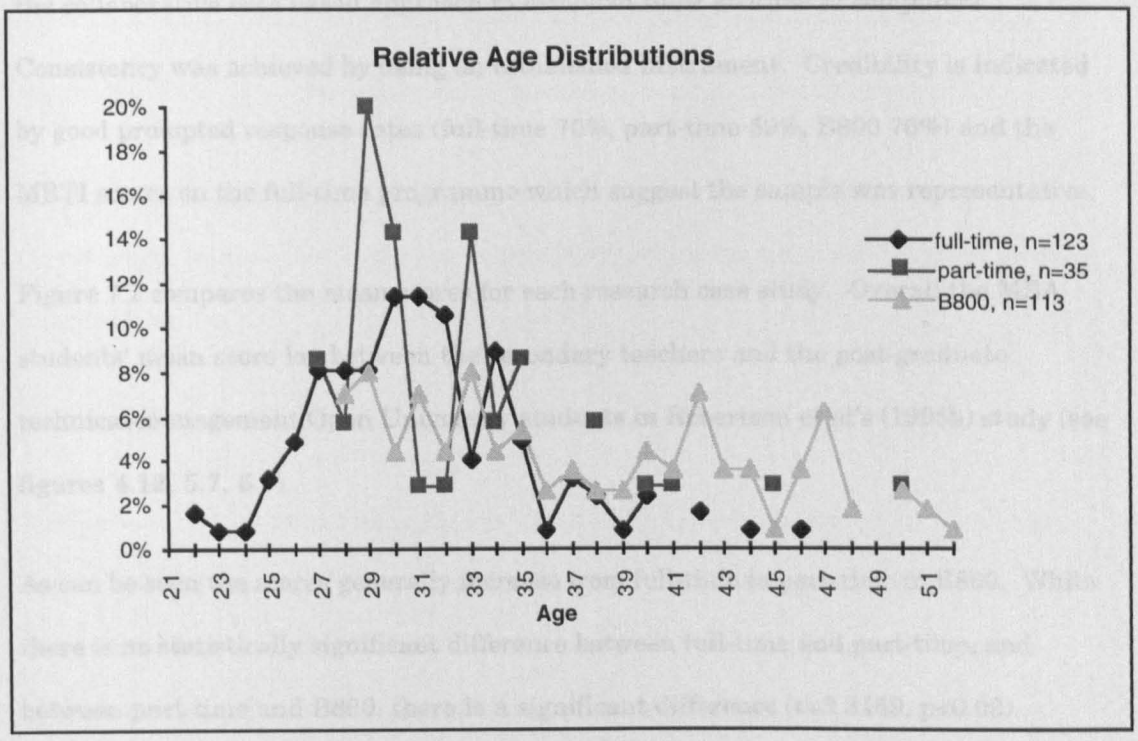

Figure 7.1 Relative Age Distribution

7.2 ATTITUDE OF MBA STUDENTS

There were two investigations which measured the students' attitudes to computer support of case based learning. These investigations are assessed for the goodness criteria of consistency and credibility. The computer attitude survey was completed by students in each research case study and the results are summarised and compared in 7.2.1. The computer support of case based learning questionnaire was completed by full-time and part-time Cranfield students. The results are summarised and compared in 7.2.2. Finally 7.2.3 discusses the attitude, reflected in these investigations, of students to their use of computers in case based learning.

7.2.1 Computer attitude survey

Students in each of the research case studies were surveyed before they started to use the collaborative case based approach to establish their attitude to computers. Consistency was achieved by using an established instrument. Credibility is indicated by good prompted response rates (full-time 70%, part-time 59%, B800 76%) and the MBTI scores on the full-time programme which suggest the sample was representative.

Figure 7.2 compares the mean scores for each research case study. Overall the MBA students' mean score lay between the secondary teachers and the post-graduate technical-management Open University students in Robertson et al's (1995b) study (see figures 4.12, 5.7, 6.5).

As can be seen the scores generally increase from full-time to part-time to B800. While there is no statistically significant difference between full-time and part-time, and between part-time and B800, there is a significant difference ($t=3.3469$, $p<0.02$) between full-time and B800 computer attitude mean scores. In addition the difference

on the cognitive sub-scale mean score between full-time and part-time was significant ($t=2.2938$, $p<0.05$). Despite the difference in overall score between full-time and B800 there was no significant difference in the behaviour, liking or use sub-scale mean scores.

Sub-scale	**full-time**	**part-time**	**B800**
Anxiety	3.86	4.00	4.15
Confidence	3.87	3.97	4.02
Cognitive	3.65	3.79	3.76
Behaviour	3.79	3.77	3.81
Liking	3.98	4.08	4.12
Use	3.41	3.38	3.47
Competence	3.94	4.06	4.26
Computer Attitude Scale	**3.78**	**3.87**	**3.94**
Number of respondents	123	35	113
Number of female	14	6	24

Figure 7.2 Computer Attitude Scale mean scores for each research case study

These results suggest that with larger populations the differences between the three modes might become significant but achieving this would mean involving other years or programmes.

7.2.2 Computer support of case based learning

Students on the full-time and part-time Cranfield programmes, for whom the three stage model of case based learning is made explicit, were surveyed on their computer use during the three stages. They were surveyed at the start and end of the core programme and, where exam anonymity numbers were given, responses to the two surveys were correlated. Response rates were good particularly for the first

questionnaire (first questionnaire: full-time 70%, part-time 59%; second questionnaire: full-time 35%, part-time 26%) but it was not possible to correlate results for the part-time surveys.

For each stage students were asked how much they used computers, why they used computers and what additional support they would use if it were available (appendix B). The qualitative responses were open coded using NUD•IST (see appendix C for index trees) considering the purpose of computer usage and desires for further support. In open coding it was necessary to draw on my experience as a student at Cranfield to interpret some of the cryptic responses. Coding was discussed with another management researcher but who had no direct experience of being an MBA student. The sample size (125 full-time and 39 part-time students gave open-ended responses) meant that it was also possible to draw some quantitative conclusions.

Thus consistency comes from my direct knowledge of MBA students and credibility from the good response rates, an explicit method of analysis and involvement of another management researcher in the coding.

In both research case studies the use of computers in all three stages was greater in the second questionnaire than the students expected in the first questionnaire (see figures 4.13 and 5.8) but the change was greater for the part-time students. By the end of the core course most students used computers for the individual (full-time 92%, part-time 93%) and group (full-time 87%, part-time 100%) stages and over half the students used a computer during the class stage (full-time 55%, part-time 67%).

There were considerable similarities in the things for which students used or wanted to use computers. Figure 7.3 shows a summary of the open coding of responses where the kind of things discussed were similar. In the purpose of computer support there was a similar emphasis and comments for many of the sub-categories. In the full-time study communication was part of process improvement ('Sharing information') while in the

part-time study there were many comments made about the use of Lotus Notes particularly in the context of group work. In general while the full-time students saw presentation as an important use during all three stages, the part-time students' comments were more concerned with improving the process including data manipulation and communication.

Sub-category	**Number of students commenting**	
	full-time (out of 125)	part-time (out of 39)
Purpose of computer support		
Presentation	65%	46%
Data manipulation	60%	72%
Computer-aided learning	20%	21%
Process improvement	43%	46%
Sharing information	22%	-
Communication	-	54%
Desire for computer support		
Enhanced equipment	28%	8%
Network	21%	5%
Disc based information	13%	5%
Unhappy with technology provision	18%	-
Technology doubts	-	28%

Figure 7.3 Frequency of comments made by full-time and part-time students

The sub-categories in the desire for computer support were also similar but less frequently commented upon by part-time students. This difference was also reflected in the comments made reflecting concerns over technology provision. The full-time students who thought the use of computers was inappropriate sometimes revealed their

inexperience while part-time students more often commented about the capabilities of current technology. More full-time students than part-time students commented on the inadequacies of the technology provision at Cranfield.

7.2.3 Attitude of MBA students

In the Cranfield research case studies the results of the two investigations are compatible with both investigations indicating a high level of confident computer use. Moreover the part-time students with slightly higher computer attitude scores appeared to have a slightly more sophisticated attitude, with greater emphasis on improvements to process and more informed doubts on the capabilities of current technology. With their still higher computer attitude scores, it is reasonable to assume that if B800 students had been aware of the three stage model and had been given the questionnaires, the results would have been similar.

The two investigations show MBA students uniformly believe they both like and use computers extensively at all stages of case learning. They have high levels of confidence in their ability to use computers competently for a range of tasks.

7.3 BEHAVIOUR OF MBA STUDENTS

There were three investigations that explored the students' behaviour when using computers to support the process and content of case based learning. These investigations are assessed for the goodness criteria of consistency and credibility. The use of computerised cases was explored in the Cranfield full-time core and Open University B800 courses. The investigations and findings are discussed in 7.3.1. The use of computer conferencing on the Cranfield part-time core course is discussed in 7.3.2. The students' behaviour in using computer support during case based learning is summarised in 7.3.3.

7.3.1 Computerised cases

The Cranfield full-time programme provided the opportunity to conduct a quasi-experiment using the kind of minimalist resource based computerised case recommended by Younger (1995). Two cases were converted to the minimalist computerised form described in 4.5.1 and given to two of the four streams of students in addition to the paper version of the case. Study groups and lectures from streams that did and did not have the computerised case were videoed and observed.

The Open University B800 module provided the opportunity to observe the introduction of a computerised business simulation case played by students at residential school and subsequently remotely using FirstClass to submit and receive results. The main data collection method was by participant observation during the development of the residential school, as ARKEA tutor at two residential schools and during the end of module evaluation meetings. Key documents were collected and a copy of the review conference was taken.

The aim of both investigations was to investigate whether the availability of data in electronic form enhanced the learning experience in terms of efficiency or effectiveness. In addition the investigations provided an opportunity to study the students' behaviour in using computers.

In the Cranfield investigation commentaries were written about the study groups and lectures from the videos recorded for each electronic case (4.5.3 and 4.5.4). The commentaries compare the work on the case, the observed use of computers and comments made about the use of computers. Analysis was based on these commentaries supported by comments made by students and faculty to the researcher at the time. Analysis of the Open University investigation was based upon open coding key documents and the review conference supported by observation and discussion with the course team and tutors.

Consistency in these investigations depends largely upon my ability to interpret observations as student or faculty. In the Cranfield investigation this was no problem because of my experience as a student and a member of faculty for the full-time programme. In the Open University investigation it was more difficult because of my limited experience as a student or regional academic. In consequence I placed a greater reliance on the analysis of the documents and review conference.

Credibility in the Cranfield investigation is based upon an explicit analysis approach and the inclusion of the commentaries. In addition a summary of the investigation has been accepted for publication (Oram 1998). For the Open University investigation credibility is demonstrated by my continued association with the use of ARKEA in 1997 and 1998. In particular recommendations arising from this research influenced the use of ARKEA in 1997.

The provision of the cases in computerised form was generally accepted but the use of the data in electronic form was dependent on the individual student's competence. At Cranfield some students were very enthusiastic about the computerised cases and faculty generally recognised their potential as a low cost but extensible implementation of multimedia. Given the problems of introducing a computerised simulation case to be run face-to-face and remotely for 1200 students and 80 tutors, the Open University use of ARKEA was a success with over half the optional remote rounds being played.

One of the problems of assessing efficiency and effectiveness in MBA learning is that students are instrumental and tend to work harder if necessary to achieve acceptable results. Consequently although the differences highlighted for one of the Cranfield cases 4.5.3 were slight they do indicate an improvement in efficiency and effectiveness for students with the computerised case. With the other case at Cranfield the use of computerisation allowed faculty to provide a more realistic simulation of reality more easily.

In the Open University case efficiency was improved for all students by allowing more rounds to be played than would have been possible for a manually operated simulation. The effectiveness of ARKEA was affected by the tutors' lack of understanding of the software leading to neglect of pedagogic aims. This demonstrated the importance of including all the interactions in the extended Laurillard model (2.2.1). ARKEA aimed to integrate the functional material taught in the module and provide a practical exploration of group dynamics. The use of the computer seemed to accentuate the importance of group dynamics but this was not always recognised by students. Moreover for some students, whose groups worked, their effectiveness was increased by exploiting the software to undertake what-if analysis.

The Cranfield investigation revealed an interesting disparity between the students' beliefs and abilities. In both the lectures and study groups there were numerous examples of students failing to exploit the data in the computerised cases because of a lack of basic computer manipulation skills. There were several examples of students providing remedial assistance and an example of students finding data collaboratively when they had been unable to find it individually.

In the Open University investigation students were rarely observed using the computer but the simulation software did have to be used to prepare a submission and remote rounds had to be submitted using FirstClass. However, only one student in each group had to use the software so the remote submission rates only imply about 120 active computer users. If students had been as enthusiastic computer users as their attitude scores indicated, more than nine students might have been expected to have contributed to the review conference.

7.3.2 Computer conferences

Cranfield has used computer conferencing to support part-time students since 1989 and in the cohort studied every student is given a copy of Lotus Notes. The behaviour of the

students in using computer conferencing was investigated by analysing their use in stages 2 and 3 of case based learning. Two study groups and two cohort wide conferences were replicated and analysed.

The participation rate, structure and content of each conference was analysed. The purpose of the messages from three similar categories with interesting thread patterns from each of the study group conferences were open coded (see figures 5.21 & 5.22). Five distinct purposes were identified and these were used to code the messages in the cohort conferences.

The interpretation of the purpose of the messages relies on my understanding the world-view of the part-time students. This is possible because although I was a full-time student at Cranfield the cases studied are common to both part-time and full-time programmes. Credibility of the results depends upon the detailed and largely quantitative approach described in 5.5.

Despite the integral nature and maturity of computer conferencing within the part-time Cranfield MBA, it was used surprisingly little with students using (perhaps preferring) many other forms of communication. The conferences tended to be dominated by a few people and were clearly not used as the prime medium by the study groups analysed. Although two thirds of the students contributed to the general cohort conference the overall number of messages sent by most students was low (estimated to be no more than 5 per month across all conferences).

Within the study groups, the use tended to be for synchronisation and dissemination rather than discussion. This is completely the opposite to the communication observed in the videos of study group discussions in the full-time programme. If the cohort conferences are compared with the lectures observed in the full-time programme then the discussions are very thin and involve far less student participation. While the use

of conferencing did not improve the effectiveness of the students it may have helped to improve efficiency for those students who used it.

The narrow range of computer attitude scores was not reflected in the students' behaviour with a few enthusiasts, a large number of occasional users and many non-participants. Analysis of the conference structure revealed a lack of expertise and discipline in using the conferencing tool despite the students' high attitude scores. The Lotus Notes category in the cohort wide conference contained many examples of students being unaware of some basic concepts in Notes. Although training on Lotus Notes was rather minimal, no comments were made in the conference about the training.

7.3.3 Behaviour of MBA students

Within the limitations of the investigations, the study of the use of computerised cases and of conferencing revealed similar behaviour.

Although usage of computers was clearly widespread it was not universal with a small number of students not using a computer in any of the three stages of case based learning.

Throughout there was some evidence that computer use improved efficiency. For Cranfield students there were many examples of students failing to make efficiency gains because of a lack of competence. This was often not recognised as a problem by students. Competent use of computers by the B800 students was difficult to observe but there is no evidence to suggest they were significantly different from the Cranfield students.

In general computers were used by students to support the process of case based learning rather than the content although there were some indications that students with sufficient expertise did have effectiveness gains.

7.4 FINDINGS

The discussions in sections 7.2 and 7.3 lead to the following propositions:

Proposition 1: UK MBA students are uniformly enthusiastic about computers and believe in their ability to competently use them for a range of tasks.

This proposition is based on the findings of the computer attitude survey which satisfied criteria of goodness and utility and so is established by this work.

In consequence, Business Schools are justified in their inclusion of computer support in the marketing of MBA programmes. Moreover, use of computer support in MBA programmes is unlikely to meet with opposition from students. The reactions of tutors in the B800 study indicates that the same may not be true of MBA tutors. It would be interesting to investigate this by sampling the computer attitude scores for MBA tutors.

Proposition 2: Most UK MBA students use computers extensively at all stages of case based collaborative learning.

This proposition is based on the findings of the computer support of case based learning questionnaire which satisfied criteria of goodness. Although the questionnaire was only applied to the full-time and part-time MBA programmes it is argued (7.2.3) that the results may be extended to B800 and so utility is established by this work.

As computers are already used routinely by MBA students and they are enthusiastic about computer use, the environment is ripe for increased computer support. However,

this work has indicated that the introduction of new computer support into an MBA programme does not necessarily significantly improve student learning.

Proposition 3: There is a dissonance between computer attitude and computer use for many UK MBA students.

This proposition arises from the difference in findings between the attitude and behaviour investigations. Although the behaviour investigations do not meet such strict quality criteria as the attitude investigations, the dissonance is sufficiently marked for it to be established. One important consequence of this proposition for further research is that studies involving MBA students must include qualitative studies of actual student behaviour.

Further work is needed to find out what leads to this dissonance in the case of individual students. Is it that their limited experience of computer use supports their attitude or is it an inherent characteristic of the type of students drawn to MBA programmes?

This dissonance helps to explain why computer support initiatives in MBA programmes are not more effective. Where training in technology is provided it is usually optional, for students who think they need it, and is not assessed. However, students who believe they are already competent users will not attend the training. So, when evaluating innovations involving computers qualitative studies of actual student behaviour must be part of the evaluation.

Proposition 4: UK MBA students can improve effectiveness and efficiency in case based collaborative learning through the use of computers.

This proposition is based on the findings of the behaviour investigations. Although these investigations do not meet such strict quality criteria as the attitude investigations, the proposition as it stands is established by this work.

In the students' work on the Cranfield Telford Toys case some students were more efficient in that they used the machine readable version of the figures and more effective in that their analysis was more extensive. However there was also a widespread lack of knowledge of 'cut and paste' which prevented many students from exploiting the machine readable version of the case. This indicates that if the dissonance between attitude and behaviour (proposition 3) is addressed there is the potential for improving students' efficiency and effectiveness.

Proposition 5: For collaborative case based learning to be effective, all elements of the extended Laurillard model need to be present.

The investigation into the use of ARKEA in B800 illustrated the consequences of tutors failing to complete stage 3 of the collaborative case based approach. This could have been predicted from the extended Laurillard model presented in 2.2.1. In 1997, in part as a consequence of my recommendations from the model, considerable effort was spent explaining to tutors the aim of the case and their role in the use of the computer. Subsequently, the stage 3 reflections occurred at residential schools and there was a reduction in the number of dysfunctional groups and a significant increase in remote playing (76% of remote rounds were played in 1997 compared with 54% in 1996).

More research is required to investigate the need for all elements of the extended Laurillard model and which of these may be effectively handled by computer support. Moreover the B800 example indicates that there may be a value in making the model explicit to tutors, students or both.

Proposition 6: In collaborative learning the preferred hierarchy of communication modes is: face-to-face, telephone, email/fax, conference.

There was some indication of this hierarchy with both the part-time Cranfield and B800 students but as most of these modes were not studied further research is needed. If this preferred hierarchy applies to most MBA students then it needs to be considered when designing computer support of MBA programmes. In particular, students will only use email or electronic conferencing when there are constraints which prevent face-to-face communication.

Considering the propositions together, there is considerable scope for using computers to support case based collaborative learning (propositions 2 and 4). Moreover MBA students are confident about their use of computers (proposition 1). However the introduction of computer support initiatives are likely to meet with problems if the dissonance between attitude and behaviour (proposition 3) is not addressed. The next section speculates on how these findings might shape future MBA programme design and delivery.

7.5 IMPLICATIONS FOR MBA PROGRAMME DESIGN AND DELIVERY

MBA students are enthusiastic computer users who expect computer support to be an integral part of an MBA programme, not a bolt on extra:

> *'So it definitely felt like being experimented by a set of people that had suddenly discovered that computers exist and gee shouldn't we be doing something with them.' AR in ARKEA review conference*

This is particularly true if, like Weatherhead (Boyatzis et al 1995) the programme has recently been re-engineered to remain competitive. However this research has shown

that this enthusiasm is not matched by competence despite the students' apparent confidence.

It would seem that the time has come for UK MBA programmes to regard basic computer skills in the same way as they treat English language or mathematics competence; students are expected to demonstrate this competence on entry and there are assessed remedial classes for those students who do not make the grade. While some faculty may feel that this is unreasonable the results of the computer attitude survey suggest that students would accept such an entry hurdle and this approach is adopted already by some US institutions (AASCU 1995).

The advantage of taking this line is students could be expected to use basic techniques such as 'cut and paste' to improve their efficiency. However, it would not address the more difficult task of teaching students how to effectively learn collaboratively using computers.

At present, MBA programmes rightly emphasize the need to teach students coming from a largely individual learning culture how to learn from collaborative working. However, teaching about computer support seems to be largely confined to the mechanics of which button to press, rather than the collaborative learning process. Moreover support in the use of the technology is often provided by technicians rather than academics.

If computer support pervades the collaborative case based learning approach then the most effective way of teaching students how to use the technology will be as an integral part of teaching students how to learn from collaborative cases. This addresses the dissonance between computer attitudes and ability through affective learning.

Cranfield already have an induction week where students study several practice cases; if computers support was pervasive it would naturally be included in the induction

process. For example, if the majority of cases were distributed electronically, the induction cases would be electronic. Assuming students were using an electronic collaboration tool, they would learn in the induction week how to annotate the case during their individual study using the electronic tool. This learning might include the mechanics of how to add annotations but more importantly students would learn how to write annotations that were useful to the study group.

Where collaborative case based learning is not the dominant approach as in the Open University Business School then the use of the technology will have to be taught rather more explicitly as in the current student technology induction course. This course starts by teaching the mechanics then moves on to socialisation and collaboration. However, the dissonance between attitude and ability needs to be addressed either by assessing the course or by requiring the student to demonstrate competence by, for example, requiring them to submit their assignments and receive tutor feedback via the conferencing tool.

There was some evidence from the resource based computerised case investigation that student experts could be used to transfer computer skills in the same way as Cranfield uses student experts for accounting. However there is a danger that the student experts will expect collaborative learning using computers to be similar to cooperative working and thus undermine the learning element (Heeren 1996).

The integration of computer support in case based collaborative learning implies that cases will mainly be made available to students electronically. This work has established that minimalist electronic cases can be produced from paper cases at low financial cost. In the resource based computerised case investigation faculty welcomed the cases and there was some evidence of improved efficiency and effectiveness for students with sufficient expertise. There is an attitude amongst management faculties (supported by the work being done at Harvard) that electronic cases means multimedia.

This view was prevalent at Cranfield and is evidenced in the reactions by B800 tutors to the DOS-based ARKEA case. However this work supports the findings of Younger (1995) and was welcomed when presented at EDINEB '96 (Oram 1996c). Further work is needed to establish under what circumstances the additional costs of full multimedia are justified.

The provision of cases electronically and the regular use of an electronic tool to support collaboration means that changes in the three stage model are both practicable and desirable.

As illustrated in this work, the provision of data for cases electronically can shift the emphasis from data input to analysis. This, coupled with the sharing of annotations made during individual study of a case, means that students would require less time for the individual stage before moving to the group stage. Electronic collaboration would make it easier for students to move between the individual and group stage. The advantage is that students would increase their effectiveness by studying more scenarios.

It would also be possible for tutors to blur the distinction between the group and class stage by monitoring group progress electronically and intervening with supplementary material or further questions. This would make the cases more realistic and allow the tutor to stretch the more able groups.

Finally, the availability of electronic solutions to the case would allow the class discussion to be student led, for example, by the tutor specifying after submission but before the class which group would present their solution and which would lead the critique. This would allow students to study more solutions and to more effectively contribute to the class discussion. The hierarchy of communication modes suggests that it would not be desirable to replace the face-to-face class discussion with an electronic discussion.

Computer support of case based collaborative learning can have profound implications for MBA programmes but to achieve significant change institutions need to view computer support as an integral part of the programme and address the dissonance between MBA students' attitudes to computers and their ability to use computers.

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APPENDIX A

COMPUTER ATTITUDE SURVEY

The following five pages are from the first questionnaire administered to the full-time students.

The versions administered to the part-time and the distance learning students differed only in the wording of the first page, in particular there was no reference to exam number on the distance learning version.

Computer Support of Case Based Learning

This questionnaire is designed to find out how you feel about computers and the case method of learning at the start of your MBA course. There are no right or wrong answers.

All answers are confidential and anonymous. They will only be published in unattributable or aggregate form. To preserve anonymity the School uses exam numbers. Please use you exam number (not your name) to identify this questionnaire so that your answers can be correlated to your answers to future questionnaires but your anonymity preserved.

Exam number

Would you please start by providing some background information.

Age (in years)

Sex

First or preferred language

Now, please turn over the page and answer the questions about case based learning based on your initial experience.

The statements below are designed to find out what you feel about computers. There are no right or wrong answers.

Please indicate with a tick in the appropriate box the extent to which you agree or disagree with each statement. *Strongly agree* is the box on the right and *strongly disagree* is the box on the left. Please try to go through it fairly quickly. If you think your answer depends on the context then tick *not sure*, otherwise try to avoid that box.

	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
All computer people talk in a strange and technical language	☐	☐	☐	☐	☐
Computers are everywhere	☐	☐	☐	☐	☐
Working with computers makes me feel uncomfortable	☐	☐	☐	☐	☐
I would like working with computers	☐	☐	☐	☐	☐
Computers are difficult to understand	☐	☐	☐	☐	☐
Computers make mistakes a lot of the time	☐	☐	☐	☐	☐
I'm sure I could do good work with computers	☐	☐	☐	☐	☐
I think I would enjoy working with computers	☐	☐	☐	☐	☐
Males like computers more than females do	☐	☐	☐	☐	☐
The challenge of solving a problem with computers does not appeal to me	☐	☐	☐	☐	☐
Electronic machines such as video are really hard to use	☐	☐	☐	☐	☐
I'm not the type to do well with computers	☐	☐	☐	☐	☐
I would feel at ease in a computer class	☐	☐	☐	☐	☐
I'm sure I could learn a computer language	☐	☐	☐	☐	☐
I don't know how some people can spend so much time in front of a computer and seem to enjoy it	☐	☐	☐	☐	☐

	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
I think using a computer would be hard for me	☐	☐	☐	☐	☐
Learning about computers is a waste of time	☐	☐	☐	☐	☐
I know nothing about computers	☐	☐	☐	☐	☐
Computers bore me	☐	☐	☐	☐	☐
I would feel helpless if asked to perform a new task on a computer	☐	☐	☐	☐	☐
Anything a computer can be used for, I can do just as well in another way	☐	☐	☐	☐	☐
Computers will improve education	☐	☐	☐	☐	☐
I am used to using computers	☐	☐	☐	☐	☐
Working with computers makes me feel cut off from other people	☐	☐	☐	☐	☐
Computers can teach mathematics	☐	☐	☐	☐	☐
Working with computers will not be important in my career	☐	☐	☐	☐	☐
I don't think I could handle a computer course	☐	☐	☐	☐	☐
I will do as little work with computers as possible	☐	☐	☐	☐	☐
I would like to spend a lot of time using a computer	☐	☐	☐	☐	☐
I don't feel as if I know what I'm doing when I use a computer	☐	☐	☐	☐	☐

	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Computers can teach reading	☐	☐	☐	☐	☐
I sometimes show other people how to use a computer	☐	☐	☐	☐	☐
People who use computers are seen as being more important than people who don't	☐	☐	☐	☐	☐
Generally I would feel OK about trying a new problem on the computer	☐	☐	☐	☐	☐
I'm no good with computers	☐	☐	☐	☐	☐
Computers sometimes scare me	☐	☐	☐	☐	☐
People that work with computers sit in front of a computer screen all day	☐	☐	☐	☐	☐
I would like to learn more about computers	☐	☐	☐	☐	☐
I feel unhappy walking into a room filled with computers	☐	☐	☐	☐	☐
Working with computers means working on your own, without contact with others	☐	☐	☐	☐	☐
If I need to know about computers for my job, I will learn about them	☐	☐	☐	☐	☐
To use computers you have to be highly qualified	☐	☐	☐	☐	☐
If I was offered a place on a computer course I would take it	☐	☐	☐	☐	☐
Working with a computer makes me feel very nervous	☐	☐	☐	☐	☐
I feel threatened when others talk about computers	☐	☐	☐	☐	☐

	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Having my own portable computer would help me in my work	☐	☐	☐	☐	☐
Computers are confusing	☐	☐	☐	☐	☐
Computers make me feel uncomfortable	☐	☐	☐	☐	☐
You have to be brainy to work with computers	☐	☐	☐	☐	☐
I get a sinking feeling when I think of trying to use a computer	☐	☐	☐	☐	☐
If someone gives me a new computer to look at I'm sure I could get some of the programs to run	☐	☐	☐	☐	☐
Not many people can use computers	☐	☐	☐	☐	☐
Computers frustrate me	☐	☐	☐	☐	☐
People that work with computers make really good money	☐	☐	☐	☐	☐

Thank you for completing this questionnaire - it will be collected from you in class on Friday morning

APPENDIX B

COMPUTER SUPPORT OF CASE BASED LEARNING QUESTIONNAIRE

The following page is from the questionnaire administered to the full-time and part-time students at the beginning of their core courses.

The versions administered at the end of the core courses did not explain the three stage model.

According to one authority on MBA teaching, collaborative cased based learning has the following three stages: "[The students] should read and work on the case on their own and depending on the subject taught that may involve a fair amount of numerical analysis or it may involve much more determining and expressing ideas about a particular problem. The second stage would then be what is often known as a syndicate group or study group and that would involve about half a dozen people who belong to the course sitting down and spending, perhaps, up to an hour discussing the problems - really trying to refine their ideas. And then of course the third stage is in the classroom which, again, can be run in a whole variety of ways depending on the scale of preparation that has gone on before."

Using this definition and based on your initial experience, at each of the stages do you use any form of computer support? Please tick one box for each stage.

	None	Some	A lot
Individual work	❑	❑	❑
Group work	❑	❑	❑
Class work	❑	❑	❑

If you use computer support, <u>why</u> do you do so ? Again, please answer separately for each stage.

Individual work:

Group work:

Class work:

<u>What</u> additional computer support would you like to use or would you use if it were available ?

Individual work:

Team work:

Class work:

APPENDIX C

NUD•IST INDEX TREES

The following five pages are a copy of the NUD•IST report detailing the nodes on the Index Tree.

Q.S.R. NUD.IST Power version, revision 4.0.

Licensee: Tagg Oram Partnership.

PROJECT: IANPHD3, User Ian Oram, 5:29 pm, Dec 15, 1997.

(1) /Demographics
(1 1) /Demographics/Sex
(1 1 1) /Demographics/Sex/Male
(1 1 2) /Demographics/Sex/Female
(1 1 3) /Demographics/Sex/Not given
(1 2) /Demographics/Age
(1 2 1) /Demographics/Age/21-23
(1 2 2) /Demographics/Age/24-26
(1 2 3) /Demographics/Age/27-29
(1 2 4) /Demographics/Age/30-32
(1 2 5) /Demographics/Age/33-35
(1 2 6) /Demographics/Age/36-38
(1 2 7) /Demographics/Age/39+
(1 2 8) /Demographics/Age/Not given
(1 3) /Demographics/First language
(1 3 1) /Demographics/First language/English
(1 3 2) /Demographics/First language/Twi-English
(1 3 3) /Demographics/First language/Italian
(1 3 4) /Demographics/First language/Greek
(1 3 5) /Demographics/First language/English-Mandarin
(1 3 6) /Demographics/First language/German
(1 3 7) /Demographics/First language/French

(1 3 8) /Demographics/First language/Malaysian

(1 3 9) /Demographics/First language/Danish

(1 3 10) /Demographics/First language/Japanese

(1 3 11) /Demographics/First language/Arabic

(1 3 12) /Demographics/First language/Afrikaans

(1 3 13) /Demographics/First language/Hindi

(1 3 14) /Demographics/First language/Not given

(1 4) /Demographics/MBTI

(1 4 1) /Demographics/MBTI/ISTJ

(1 4 2) /Demographics/MBTI/ISFJ

(1 4 3) /Demographics/MBTI/INFJ

(1 4 4) /Demographics/MBTI/INTJ

(1 4 5) /Demographics/MBTI/ISTP

(1 4 6) /Demographics/MBTI/ISFP

(1 4 7) /Demographics/MBTI/INFP

(1 4 8) /Demographics/MBTI/INTP

(1 4 9) /Demographics/MBTI/ESTP

(1 4 10) /Demographics/MBTI/ESFP

(1 4 11) /Demographics/MBTI/ENFP

(1 4 12) /Demographics/MBTI/ENTP

(1 4 13) /Demographics/MBTI/ESTJ

(1 4 14) /Demographics/MBTI/ESFJ

(1 4 15) /Demographics/MBTI/ENFJ

(1 4 16) /Demographics/MBTI/ENTJ

(1 4 17) /Demographics/MBTI/Not given

(1 5) /Demographics/Programme

(1 5 1) /Demographics/Programme/FT

(1 5 2) /Demographics/Programme/PT

(1 5 3) /Demographics/Programme/DL

(2) /Questionnaire

(2 1) /Questionnaire/Stages

(2 1 1) /Questionnaire/Stages/Individual

(2 1 2) /Questionnaire/Stages/Group

(2 1 3) /Questionnaire/Stages/Class

(2 2) /Questionnaire/Why or what

(2 2 1) /Questionnaire/Why or what/Why

(2 2 2) /Questionnaire/Why or what/What

(2 3) /Questionnaire/1st or 2nd

(2 3 1) /Questionnaire/1st or 2nd/1st

(2 3 2) /Questionnaire/1st or 2nd/2nd

(2 4) /Questionnaire/1st and 2nd

(10) /FT Purpose

(10 1) /FT Purpose/Process notes

(10 2) /FT Purpose/Manipulate data

(10 3) /FT Purpose/CBL

(10 4) /FT Purpose/What-ifs

(10 5) /FT Purpose/Understanding better

(10 6) /FT Purpose/Presentation

(10 7) /FT Purpose/Speed-accuracy

(10 8) /FT Purpose/Sharing information

(10 9) /FT Purpose/IL

(11) /FT Desires

(11 1) /FT Desires/Equipment better-faster

(11 2) /FT Desires/Network

(11 3) /FT Desires/Disc based information

(11 4) /FT Desires/Unhappy with technology provision

(12) /PT Purpose

(12 1) /PT Purpose/Presentation

(12 2) /PT Purpose/Analysis

(12 3) /PT Purpose/Management

(12 4) /PT Purpose/Circulate-confirm-expose

(12 5) /PT Purpose/CBL

(12 6) /PT Purpose/Group communication

(12 7) /PT Purpose/Lotus Notes

(12 8) /PT Purpose/Business Game

(12 9) /PT Purpose/Effficiency-effectiveness

(13) /PT Desires

(13 1) /PT Desires/Scanner

(13 2) /PT Desires/Video Conference

(13 3) /PT Desires/Computer presentation

(13 4) /PT Desires/Remote access to information

(13 5) /PT Desires/Computerised lecture notes

(13 6) /PT Desires/Anti technology

(15) /FT Purpose summary

(15 1) /FT Purpose summary/Data manipulation

(15 2) /FT Purpose summary/Presentation

(15 3) /FT Purpose summary/Computer-aided learning

(15 4) /FT Purpose summary/Process improvement

(16) /PT Purpose summary

(16 1) /PT Purpose summary/Presentation

(16 2) /PT Purpose summary/Analysis

(16 3) /PT Purpose summary/Computer-aided learning

(16 4) /PT Purpose summary/Process improvement

(16 5) /PT Purpose summary/Communication

(17) /PT Desires summary

(17 1) /PT Desires summary/Enhanced equipment

(17 2) /PT Desires summary/Better support of process

(17 3) /PT Desires summary/Technology doubts